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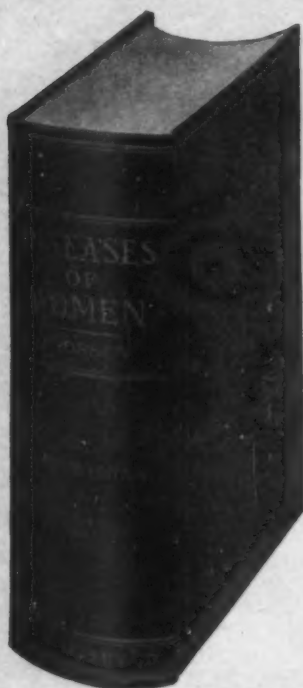
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Original Communications

THE TEST OF LABOR IN RELATION TO CESAREAN SECTION. COMPARATIVE RESULTS OBTAINED BY ELECTIVE AND SECONDARY OPERATIONS BASED UPON A PERSONAL EXPERIENCE OF 92 CASES*

BY RUDOLPH W. HOLMES, M.D., AND ALLISON L. BURDICK, M.D.,
CHICAGO, ILLINOIS

SINCE Edward Reynolds¹ presented a thesis on "The Superiority of Primary Over Secondary Cesarean Sections, etc.," before this Society, in 1907, there has been a massive accumulation of literature covering the subject. In the fifteen years since it was written it has had a profound influence in developing the principles governing the safe performance of cesarean section. This paper has also been a guiding lesson to the senior writer these many years in his endeavor to formulate rules for a safe conduct of women who would have potential difficulties in labor which might necessitate suprapubic delivery. With increasing experience he has amplified, from time to time, his general rules so that now he believes it is possible to lay down concrete directions which will vouchsafe to the woman essentially the same security after the labor has been in full force for a period, as when the section is done before contractions have begun. In fact, that the purport of this paper may be fully appreciated, contrary to the generally accepted views,—and which the senior writer has likewise always corroborated in the main until a careful analysis of his cases these late years convinced him to the contrary,—there is com-

*Read at the Forty-seventh Annual Meeting of the American Gynecological Society, Washington, D. C., May 1-3, 1922.

NOTE: The Editor accepts no responsibility for the views and statements of authors as published in their "Original Communications."

paratively little difference in the safety of the operation when performed in advanced labor, before the advent of exhaustion, over those operations performed in the last days of pregnancy. There are certain fundamental facts which stand out very clearly in making this statement valid: first, the dangers fall or rise directly as the woman has been managed properly or improperly before and in the hours of labor; secondly, the surgical judgment, the obstetric conscience in carrying out an aseptic technic, character of the personnel of the operating room, influence the outcome as much as any adventitious circumstances incident to the labor. *Per se*, the length of labor within the safe limits is of comparatively small significance, but vaginal examinations, or attempts at delivery from below are fraught with a high proportion of disaster; likewise, procrastinating until the vital forces are at the lowest ebb places the woman in jeopardy; again, *prolonged rupture of the membranes offers a serious menace to the welfare of the woman during the postoperative period.* We may place it as a definite criterion that the woman who has a truly elective operation will run a more placid, an infinitely more comfortable convalescence than she who has been subjected to hours of a distressing labor. It is essentially true that those given the test of labor practically will run the same thermal elevation as those who have had the elective section, but the former will have a continuance of that thermal course longer than the latter—an expression of lack of resistance incident to tiredness. The longer the woman is in labor, with membranes ruptured, more characteristically will the pulse have a higher rate with a more prolonged elevation of temperature over those not in labor, or with membranes intact. Further, it is clearly evident from our study of these 92 cases that some 10 to 20 per cent of women operated upon in labor, more glaringly evident if the membranes have ruptured, will run a more stormy course with a somewhat prolonged thermal elevation,—a true, though mild septic course; the clinical picture of these is distinctly worse than any of those operated electively. We will put this in concrete form in the statistical part of this paper.

While preparing this contribution we have speculated much on what constitutes the danger in a delayed cesarean section; we feel that we have much to learn of the vital forces which are compromised by hours of labor. How much is due to impairment of immunity to bacterial invasion sequential to the fatigue of labor? How much is due to the setting free of protein bodies, or by-products from forced metabolism? How much is incident to the bacterial flora so commonly the habitants of the vagina, ordinarily relatively innocuous, yet, at times, offering a serious menace to their host? Does the reparative process in the uterine incision determine cross currents, reversal of currents in the blood stream and lymphatics which carry

the bacteria to the wound! Two things stand out very clearly: one, that modern science demands that there shall be a ready clinical test which determines the patient's immunizing power, not only in this connection but for all preoperative investigation; again, a reliable test which shall determine the innocuousness or danger lying in the vaginal flora. There may be no question that with membranes ruptured a large element of risk is determined by the exposure of the presenting part to the bacterial content of the vagina, innocent on the mucosa, but dangerous when rubbed off onto the uterine or abdominal wounds. Certain it is that vaginal examinations or unwise attempts at delivery mechanically spread the inherent risk.

The opportune time for a cesarean section necessitated by gross cephalopelvic disproportion is at a designated hour, a truly elective procedure; likewise we believe that the dangers from rupture of a previous cesarean scar, the scar of an early hysterotomy or the scar of a myomectomy which demanded an incision quite through all the muscularis, are so great that a timely elective section should be the rule in such cases. The absolute indication is not germane to the topic under discussion and is herewith dismissed. The danger of rupture of the uterine scar is one which may not be lightly decried; it is of small consequence when the section was dictated by absolute deformity for, perforce, the section must be repeated at the end of each succeeding pregnancy. In the presence of relative indications, or the many adventitious circumstances which prompted the sections, subsequent pregnancies may not necessarily have to be terminated by laparotomy were it not for the consideration of the scar. This danger is so acutely appreciated in our minds that we fully and unequivocally subscribe to the dictum, "a cesarean once, a cesarean always." Case 32 was a woman who lost her first baby in an instrumental labor; her second labor terminated spontaneously, but an able gynecologist was called to remove the placenta which had escaped into the abdominal cavity through a transverse fundal rent; he sutured the rent. She came to us in her third pregnancy, six weeks before term. In view of the scar we planned to anticipate labor by cesarean section; unfortunately labor started before this designated time. Seven hours after the onset of labor the abdomen was opened; the scar had failed to unite through one-half its extent and the peritoneum alone held. Fortunately rupture had not occurred.

Is the danger of rupture real or imagined? Those who deny the probability of the rupture argue from the cases which passed through a spontaneous labor happily; the others base their contention on the calamities which have occurred, on the incidence of rupture. Harrar² found in 50 repeated sections, 42 scars had healed perfectly; 4 were attenuated; 2 had partial rupture; 2 had complete loss of integrity—

in other words, the liability of rupture according to his figures is 16 per cent. Asa B. Davis³ reported 33 repeated sections; 23 had perfect scars; 3 were thinned; 2 had partial rupture, and 1 had a complete rupture—that is, his incidence of vulnerable scars was 18.1 per cent. v. Leuwen⁴ found the scar thinned, or worse, in 20 of 117 repeated sections, 17 per cent had dangerous scars. More recently, Holland⁵ collected 92 cases of uterine scar rupture in England; 48 ruptured in labor and 34 before contractions began. He states the danger of rupture in relation to spontaneous labor is 1:4. Certainly these figures should arouse our interest. Though this topic is pertinent to the subject of relative indications, neither time nor space will permit an academic discussion of the production of vulnerable scars; they may occur in the most expert of hands.

In contrast to the absolute indication, the relative necessity offers a problem which does not exist under the imperative demand, the woman in the former class always will require the section; in the latter, later labors may not offer an indication for the operation. Are we to set the time for the performance of an ideal, elective section on a woman who may readily have a spontaneous birth, or are we to heed Schroeder's aphorism, "watchful expectancy," judiciously awaiting her to prove or disprove her functional ability? We know that fully 60 to 80 per cent of women with pelvic contractures of 8.5 to 9.5 cm. will have spontaneous labors, or at most aided by not difficult instrumentation. Are we to subject such arbitrarily to the risks of a cesarean, when normal labor so largely is probable, merely that the few who properly should have such aid may be saved a reasonable test of labor, which, withal, does not increase their hazard greatly? We do not believe such radicalism is justifiable.

Whatever may be said, a cesarean section, for the mother, does not have the security of life and health in comparison to normal parturition; neither is the sum total of discomfort or pain less for the section than a normal delivery, even with a forceps delivery of not inconsiderable difficulty. Error of obstetric judgment is too finite; how often we hear of women who have been told they had insuperable difficulty facing them, only to disprove the allegation by a labor of surprising ease; a delphic prognosis were better than such positive assertion.

There has been much incidental mention of giving a woman a test of labor in more or less elastic phraseology, but the literature is sadly lacking in concrete detail of what that test implies. As the senior writer has for many years had his formulated rules in relative disproportion and has had his meed of success, we believe a summary of his results will not be without interest, and certainly will give opportunity for a timely discussion as to what constitutes a test of

labor, and to what extent we justifiably may go in that test. We believe the first great development in laying down these rules was the abstinence from vaginal examinations; in the first 32 cases, up to the close of April, 1912, 16 cases of cesarean section were without vaginal examinations in relation to labor, i.e., 50 per cent; the second great stride was in the routine employment of rectal touch in 1913. Our rules comprise the following:

1. Internal mensuration in pregnancy determines the certainty of pelvic deformity, and its degree. We believe the general teaching that external pelvimetry is invaluable in determining pelvic capacity has done irreparable harm, for it is only by internal palpation and mensuration that any fact of worth is elicited.

2. As definitely as possible the probable date of confinement is determined.

3. Two or three weeks before this date the presentation and position are determined: the cephalopelvic relationship is fixed as clearly as possible. At this time the pelvic capacity, determined in pregnancy, is verified. The patient and husband are warned of the dangers of coitus during the last months of pregnancy, an admonition that goes to all patients.

4. Labor is awaited, or at times, the contractions are started, if possible, by castor oil and quinine.

5. The usual external preparation is made, which comprises shaving, sponge bath, enema, local cleansing, but the vagina is not entered.

6. During the early hours of labor the woman is encouraged to partake of simple liquid or semisolid food, for commonly the weak, irregular pains, so characteristic of cephalopelvic disproportion, may endure for many hours, even some days.

7. If rest is materially disturbed by a protracted nagging labor, temporary relief is given, when needed, by chloral-bromides, by mouth or rectum. Also, those with tumultuous labors are given occasional relief by the same means; morphia rarely is exhibited; scopolamine has not been employed for years.

8. Control of the pulse and temperature at frequent intervals, every two hours generally, but more frequently if there be an irregularity or increment in the pulse rate. The pulse is the valuable index of the fatigue of the woman, the general facies of distress is valuable. When the pulse rises to 90 or 100 the patient is actually reaching a stage which if allowed to continue much longer may mean true exhaustion. The resistance to pain and the stress of labor vary so enormously, one may require an earlier intervention even though she has not had an adequate test, another may safely go many hours without untoward symptoms. To continue the watchful expectancy beyond the safe limit jeopardizes the safety in a section, or makes the eventual high forceps or craniotomy imperative.

9. Control of the fetal heart.

10. If possible the time should be awaited until the os is dilated, and the membranes have ruptured; when the membranes rupture prematurely, and the head does not descend to fill the cervix, dilatation will be arrested; premature evacuation of the amniotic sac with little or no dilatation warrants a more prompt determination for the section; it is only by the opportune rupture of the fetal sac that a positive test is given.

11. During the whole course of the test of labor, control should be kept by periodic abdominal palpation and rectal touch. Rectal examinations as a routine procedure in labor were first advocated by Kroenig⁶ and Ries⁷ in 1893. Practically no further contributions were made until the senior writer, in 1915,⁸ reiterated the great advantages of routine rectal over vaginal examinations in labor. For the conduct of a case which may require a section after a test of labor, it is the most

valuable adjunct contributed to the cesarean question these last ten years. From it, every fact relevant to the correct interpretation of all phenomena of labor may be accurately determined, except the pelvic deformity and the nicety of adjustment of the head to the brim; as the former is generally determined in pregnancy, this is of no moment,—the latter may offer a problem. My associates have been taught not to make vaginal examinations unless specifically advised.

THE OPERATION

We have firmly adhered to the principles of the classic section with some minor deviations, for in our hands the method has proved of signal worth. Therefore, the uterus is always eventrated, unless conditions dictate otherwise, through as small an abdominal cut as possible; we see the only objection in the unseemly long wound. The uterus is promptly clothed with moist compresses; at the same time the abdominal wound is closed back of the uterus with a bullet forceps—at times, if there be intestinal distention with tendency for their protrusion, a pad is inserted before the forceps is applied. The field is then closely encompassed with towels. As the incision is being outlined, the assistant injects one, sometimes two, ampules of pituitrin in the uterine muscle. After outlining the opening in the uterus with the scalpel, the wall is punctured carefully at the midpoint, the index fingers introduced within the wound and the wall is torn, a method which has been followed with few exceptions since the second section. The tearing has the great advantage of never bleeding unduly in our hands, is easy of repair, is more quickly done, and expedites the delivery of the child if the placenta be anteriorly placed, for the one act opens the uterus, separates the placenta, and opens the membranes. Suturing has always been done with catgut with the exception of the first two cases where silk was used; the chromic gut is tied with every other suture. We feel that the safety of the woman lies in the close obliteration of all dead spaces; a continuous suture will loosen under the influence of retraction, and from imbibition of moisture. Few will agree with Kerr⁶ that silkworm gut is the ideal uterine suture material or that the cervix and vagina should be sponged out. We have adhered to the old method of eventration as we believe there is an inevitable spill of blood and liquor amnii in all methods of cesarean, and by eventration this danger is minimized. In our experience blood is almost never seen within the abdominal cavity and the amniotic fluid likewise is kept away. We have often thought that adhesions were produced more by amniotic fluid than blood or careful handling with gloves.

We have been strongly influenced by the belief the lessened hazards of cesarean section, in safe hands, lie more strongly in the adoption of sound surgical principles, rather than in the many deviations of technical detail suggested during recent years. Twenty years ago

there was a fervid discussion on the relative merits of various types of incisions, from the posterior median of Cohnstein, the transverse fundal of Fritsch, the typical Saenger, and finally the transverse cut through the lower segment of Kehrer. At this period Kerr summed up the situation by declaring Fritsch's incision had the greatest advantage in being farthest from the cervix. Is this still valid? We wonder whether the procedures of Sellheim, of Frank, etc., are not an expression of novelty rather than permanent value. All will agree that the peritoneum of the upper abdomen has not the same resistance to infection as the pelvic, but we await the proof that the cervical peritoneum is less vulnerable than the corporeal.

STATISTICAL DEDUCTIONS

There were 92 cesarean sections, of which 29 (2 eclamptics) were done before labor; 61 were in labor and in two, data were not available covering the point. Of the women in labor, 22 were operated upon with intact membranes; the range of labor in these was from 2 to 104 hours, an average of 26 hours. Membranes were ruptured for a definitely stated period in 22 women, a range of from 1 to 84 hours, an average of 22.2; the labors varied from 7 to 84 hours, an average of 30 hours. The period the membranes had ruptured is an actuality but we must take with reservation the duration of some of the abnormally long labors. For example: Case 56 (1916) was a repeated section; she did not come to the hospital until weak, irregular, nagging contractions had persisted for 102 hours; the section was done two hours after her admission. Again, Cases 39 (1913) and 49 (1915) were of similar character. We doubt the endurance of any woman to be in good condition after having strong, tumultuous labor for 48, 72 or 104 (!) hours. The very fact that the patients in Charts 3 and 4 (membranes ruptured for 24 to 84 hours) had a better composite temperature curve than the other divisions is *prima facie* evidence that they did not have exhausting labors.

There were 52 primiparae and 37 multiparae, respectively 56.5 and 40.2 per cent, the youngest being 17 and the oldest 44 years of age.

INDICATIONS

Of the 92 cases the pelvis was below 9 cm., i.e., 8.5 or lower, in 34 instances; in this number one had such a pelvic deformity that complete coitus was impossible; she had repeated sections; 20 had a conjugata vera of 9 cm. Eleven (11) women had repeated sections, two of which had three sections each. In twelve the pelvic contracture was not stated or the record was missing. Placenta previa dictated the section five times in the presence of minor deformity, one had placenta previa centralis with fibroids; eclampsia twice (once

with a c. v. of 8 cm.). Albuminuria (toxemia) four cases; heart disease four; two had congenital dislocations of hips. Ventral fixation and adhesions from repeated laparotomies, two cases. These were the principal indications which may be enumerated.

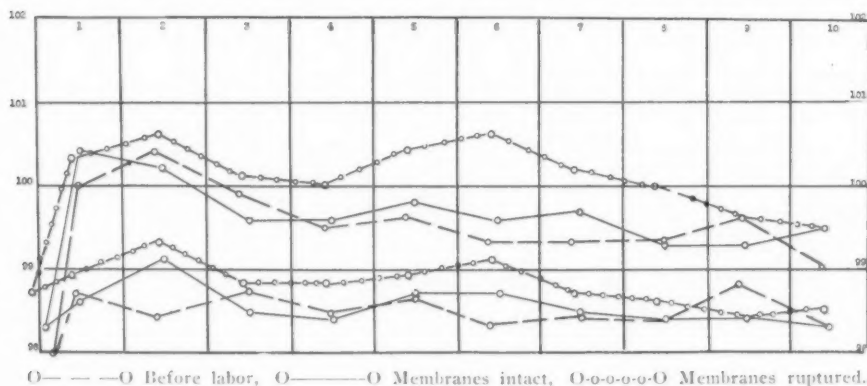
MORTALITY

During the period covering this report, from 1900 to the present time, six mothers died. Two died of eclampsia [Nos. 29 (1911), and 90 (1922)]. The first was doing well when she had a recurrence of convulsions on the second day, five in an hour, and died; the second section was done to save the baby, believing the woman was to die,

CHART 1

TEMPERATURES—HIGH AND LOW—COMPARED

Before Labor 27 Cases, Mortality, 0%,
 Membranes Intact 22 Cases, Labor 2-104 Hours: Mortality 9%, Corrected 0%
 Membranes Ruptured 25 Cases, M. R. 1-84 Hours: Mortality 8%, Corrected 4%



as after a phlebotomy and 4 to 5 hours of expectant treatment the blood pressure was 255-130; she died after the thirteenth convulsion. Both babies lived.

Cases 1 (1900) and 4 (1905) died respectively of peritonitis and general sepsis; No. 5 (1906) was diagnosed as gastric dilatation, but the fact that she ran a mild febrile course suggests peritonitis as responsible for the projectile vomiting. No. 82 (1921) had had a severe cold for days, 10-24 days before labor set in; at the time of entering the hospital she still had some laryngeal irritation, and a temperature of 102.3° F. within 20 hours of the operation, which remained high until death. She promptly developed a right pleurisy with effusion, the left pleura later became involved; the day of her death the wound showed no redness, though there was some slight serous discharge. The membranes had ruptured 24 hours before the onset of labor, the latter lasting 21 hours; the baby was born with

an offensive, putrid odor, but lived. Had she a focal infection, the atrium being her throat? This was the concurrence of opinion.

The eclamptic deaths should not be considered in connection with the mortality incident to non-toxic conditions, leaving four deaths following cesareans for pelvic indications, or other anomalies. Are we permitted to consider that the first five patients were operated upon in the period of learning, and may we segregate them from consideration of the modern mortality? We believe it is seemly. Therefore, our gross mortality was 4.4 per cent, corrected it is 1.17 per cent.

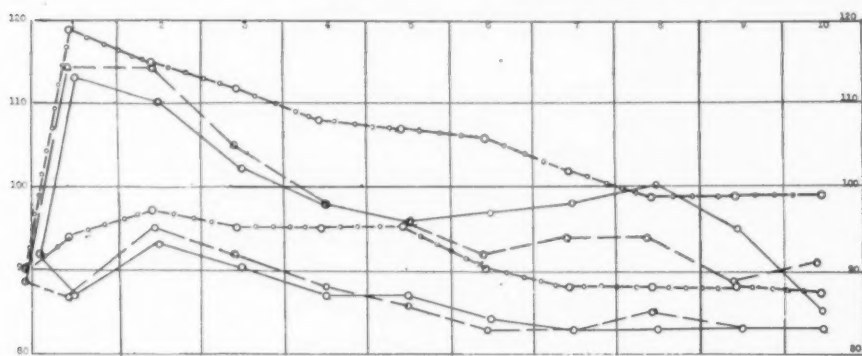
INFANT MORTALITY

Eight (8) babies succumbed either in labor or within fifteen days. Two infants were born dead after prolonged labor: in No. 8 (1906)

CHART 2

PULSE RATES—HIGH AND LOW—COMPARED

Before Labor	27 Cases,	Mortality, 0%,
Membranes Intact	22 Cases, Labor 2-104 Hours:	Mortality 9%, Corrected 0%
Membranes Ruptured	25 Cases, M. R. 1- 84 Hours:	Mortality 8%, Corrected 4%



O— — —O Before labor, O————O Membranes intact, O-o-o-o-o-O Membranes ruptured.

there was a large dermoid of the ovary blocking the brim; No. 11 (1908) had the pelvis filled by a massive cervical fibroid. One, Case 3 (1905) succumbed to a toxemia of the mother which developed into a postpartum eclampsia. One, Case 17 (1909) died on the tenth day after many convulsions, the pediatrician diagnosing the condition as meningitis; was it not more probably a brain hemorrhage, produced by prolonged labor? One, Case 15, died on the fifth day from melena and a high grade pemphigus neonatorum. Two, Cases No. 21 (1910) and No. 86 (1921) had hydrocephalus, the first also had an extensive dorsolumbar spina bifida; the mother of No. 21 was also Case No. 10, operated two years previously. Case 86 (1921) was a woman who had lost five children, was intensely anxious to have a living child; she was enormously distended, which precluded accurate pal-

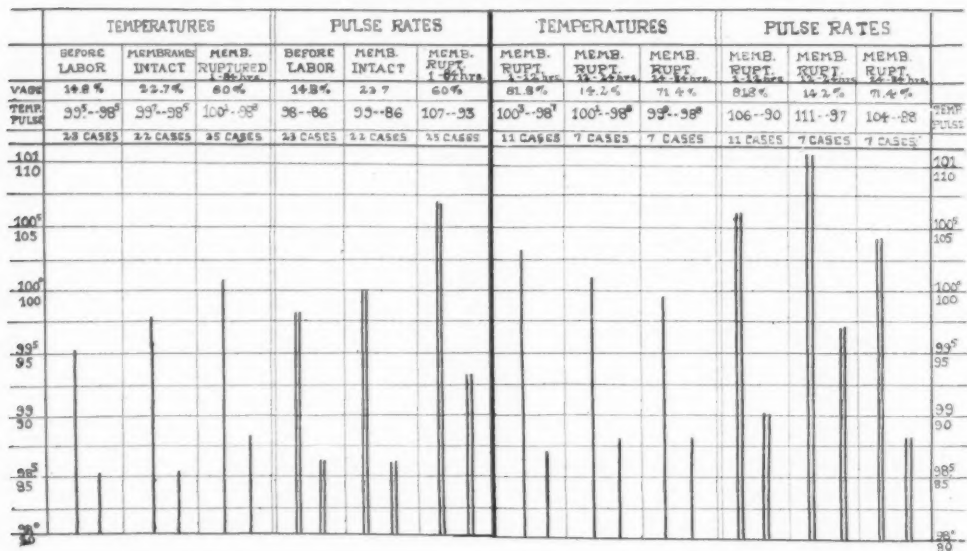
pation. The heart sounds pointed to a breech presentation which was proved at operation. To have hydrocephalus, or other gross fetal abnormality of structure is a lamentable catastrophe, and especially in a cesarean section; the one redemption in the latter instance was that the parents, as in the former case, on account of religious tenets, precluded craniotomy. One, Case 88 (1922) died on the fourteenth day from enteritis.

Therefore, there were six fetal deaths in the first 21 cases up to 1910, four of which were accidents of birth; two, after 1910, which had no connection with the birth. There was a gross loss of eight children (8.68 per cent); incident to birth, four children (4.34 per cent). In the last 75 cases there was no infant mortality due to birth.

CHART 3

DIAGRAMMATIC PRESENTATION

AVERAGE OF ALL HIGH AND LOW TEMPERATURES AND PULSE RATES FOR 10 DAYS



MORBIDITY

Various plans were devised for the purpose of showing graphically the incidence of morbidity in the various possible classifications of our cases; the one finally adopted was to segregate the cases into those operated upon before labor, those in labor with membranes intact, those with membranes ruptured up to 12 hours, 12-24 hours, and 24-84 hours. In this way we obtained 23 cases in the first, 22 in the second, 11 in the third and 7 each in the final two groups. There were insufficient cases to attempt a classification on the concurrent duration of the labor and rupture of the membranes.

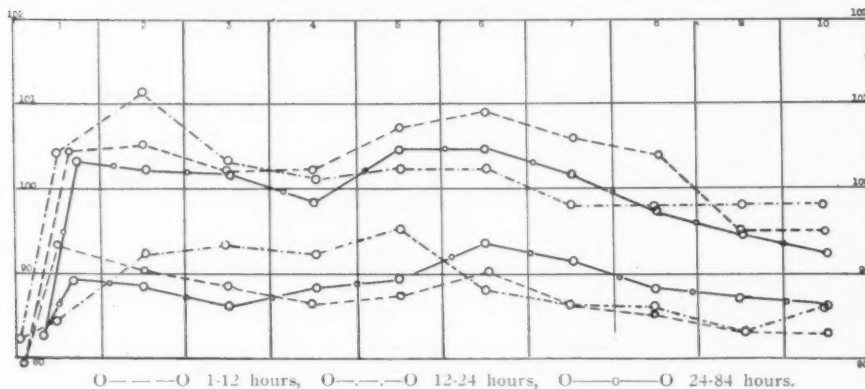
In our plan the observation of pulse and temperature last made

before operation was the initial point. Next the high and low pulse rates and temperatures for each day, irrespective of the time of day of their occurrence, were tabulated for ten days. Morning and evening temperatures were hardly comparable as only too often the high points were reached in the early morning hours. After arranging our cases in the above divisions, the high and low temperatures and pulse rates were averaged for the purpose of obtaining composite curves for the respective divisions. In obtaining the data for graphic presentation (Chart 3) for the high and low points of pulse and temperature, the averages of each for the entire ten days were obtained.

CHART 4

TEMPERATURES—HIGH AND LOW—COMPARED

Membranes Ruptured—1-12 Hours,	Labor 7-57 Hours, 11 Cases
Membranes Ruptured—12-24 Hours,	Labor 12-24 Hours, 7 Cases
Membranes Ruptured—24-84 Hours,	Labor 13-84 Hours, 7 Cases



From the fact that 15 (65.2 per cent) of the 23 patients operated upon before contractions occurred had a temperature of 100° or below permanently after three days, we took this as the index of the duration of febrility, normal or postoperative reaction. Taking the list as a whole we find that of 82 cases, 42 (51.2 per cent) were 100° or below by the third day. Therefore, we may state that three days is normal for the postoperative thermal elevation to endure. The ideal would be not to have one febrile day over 100° —no, not to have one above 98.6° —one case approximated this perfection, No. 28, 24 hours in labor with membranes ruptured a like period.

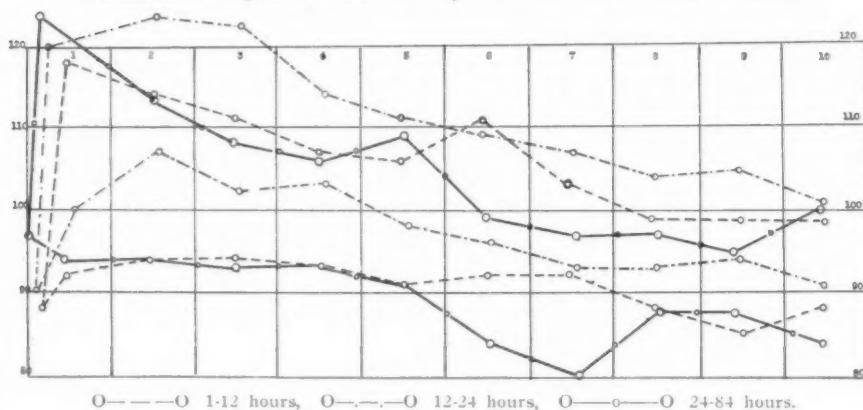
On this basis, women operated upon before labor will reach the postoperative normal on the average in 2.7 days (Chart 8); in labor with membranes intact in 4.6 days; membranes ruptured 1 to 12 hours in six days; membranes ruptured 12 to 24 hours the postoperative febrile course will be over in 7.28 days; most anomalous of all, seven patients with membranes ruptured from 24 to 84 hours, and labor lasting from 24 to 84 hours, the normal was reached in 3.8 days. As

a whole, membranes ruptured from 1 to 84 hours will show convalescence in 5.7 days. The evidence of this is further manifested in the composite temperature curves (Chart 1). Again, we believe a short, intensely tumultuous labor, say up to 24 hours, menaces a woman more who has a section than she who has a very protracted period of aberrant contractions of no great intensity, even though her membranes have been long ruptured; leaving all other considerations aside we feel there is justification in the belief that forced metabolism from violent physical endeavor produces by-products which are intensely inimical to a woman in labor, especially if she have a section; very probably this vital deterioration produces an arrest of immunity.

CHART 5

PULSE RATES—HIGH AND LOW—COMPARED

Membranes Ruptured—1-12 Hours,	Labor 7-57 Hours, 11 Cases
Membranes Ruptured—12-24 Hours,	Labor 12-24 Hours, 7 Cases
Membranes Ruptured—24-84 Hours,	Labor 13-84 Hours, 7 Cases



TEMPERATURE BEFORE OPERATION

The temperature before operation was 99° to 99.4° in 14 patients, all the rest were below 99° at this time, with two exceptions, Cases 77 and 90, the latter an eclamptic, and the former, the one who had catheterization of the uterus the day before. These two had 101° . Roughly the incidence of postoperative reaction in women operated upon before labor on the first day for temperatures 100° or below, and 100° to 101° will be respectively 49.2 and 33.9 per cent; further on the second day these temperatures will be respectively 26.4 and 52.8. Thereafter, if convalescence is assured the high temperature will drop to below 100° and will there remain. This is well shown in Chart 1; while the temperature has descended to a point below 100° on the third day, the pulse only descends to a rate below 100 on the fourth day, and remains about 90 to the tenth day. (Chart 2.)

The composite curve for the 20 patients who were operated with membranes intact, in labor from 2 to 104 hours, shows an initial rise the first day about a half degree higher than those operated before labor, falls slightly below the latter on the second day, but then continues slightly higher until the eighth day. The pulse rate is lower to the fourth day; on the fifth day it continues somewhat more elevated to the eighth day, when it drops to a point below 90.

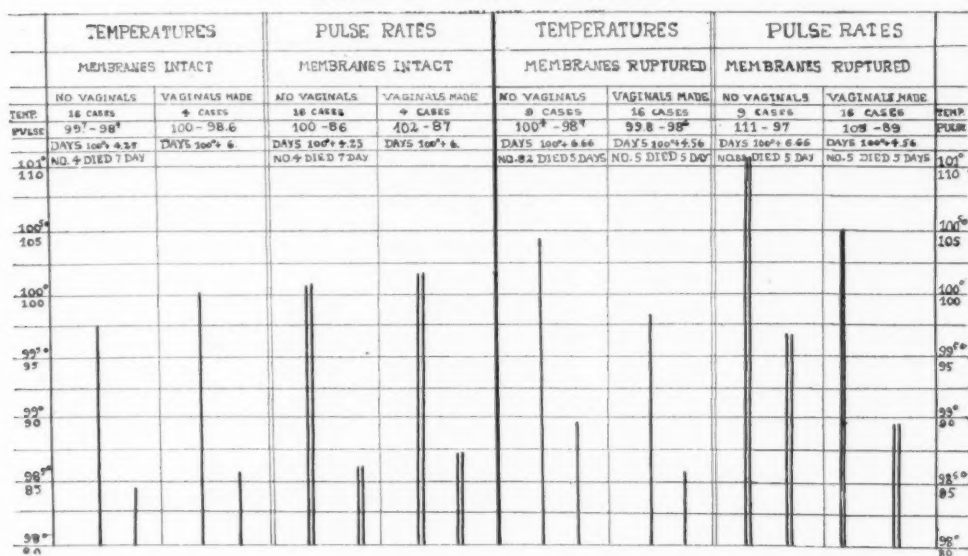
The composite temperature curve for those with membranes rup-

CHART 6

DIAGRAMMATIC PRESENTATION

INFLUENCE OF VAGINAL EXAMINATION

AVERAGE OF ALL HIGH AND LOW TEMPERATURES AND PULSE RATES FOR 10 DAYS
MEMBRANES INTACT AND RUPTURED



tured from 1 to 84 hours, labor from 7 to 84 hours, has an initial rise to 100.2°, then rises higher than that for the other two groups, and continues over 100° for eight days (Chart 1). The pulse rate takes a comparable course, and is materially higher than either the groups operated before labor, and with membranes intact; the pulse only descends so that only by the eighth day is it below 100 (Chart 2). Chart 3 presents graphically the average of all high and low temperatures and pulse rates for 10 days. This chart clearly shows the malign influence of protracted periods of membranes ruptured upon the convalescence from cesarean sections.

Charts 4 and 5 show the average temperature and pulse curves in different periods of ruptured membranes. The initial rise of temperature the first day for the three groups, membranes ruptured from 1 to 12 hours, 12 to 24 hours, and 24 to 84 hours, is practically

identical. The temperature of the first group, from 1 to 12 hours, runs an even course until the fourth day, when it rises and persists higher until the eighth day, when it rapidly recedes. The second group, membranes ruptured from 12 to 24 hours, takes a sharp rise to 101.2° on the second day, declines by the fourth, and essentially has a more normal run the remainder of the time. The third group, membranes ruptured 24 to 84 hours, runs a more placid course than the first of this series. Chart 3 graphically presents these findings in the average of all high and low temperatures and pulse rates for

CHART 7

PART I

TEMPERATURE COMPARISONS
OPERATIONS BEFORE LABOR, LABOR WITH MEMBRANES INTACT AND RUPTURED

	TOTAL CASES	100° or LESS			100°--101°			101°--102°			102°--103°			103°--104°			104°--105°			TOTAL
		NO	%	DAYS 100°+	NO	%	DAYS 100°+	NO	%	DAYS 100°+	NO	%	DAYS 100°+	NO	%	DAYS 100°+	NO	%	DAYS 100°+	
BEFORE LABOR	52				10	43.4	1.6	11	47.7	3.16				2	8.6	3				2.7
MEMBRANES INTACT	20	3	15.	0	8	30.	3	6	40.	5.8	2	10.	4				1	5	16	4.6
MEMB. RUPT. 1-12 hrs.	25	1	4	0	9	36.	4	7	28.	3.8	2	16.	7.5	2	8	6.5	2	8	15.5	5.7
MEMB. RUPT. 12-24 hrs.	11				3	27.2	7	3	27.2	3	2	18.1	9	2	18.1	6.5	1	30.9	4	6
MEMB. RUPT. 24-84 hrs.	7	1	14.2	0	2	28.5	3.5	3	42.8	5.6							1	14.2	2.7	12.8
MEMB. RUPT. 84-101°	7				4	57.1	2	1	14.2	7	2	28.5	6.3							3.9

OF THOSE IN BEFORE LABOR, 1 HAD TEMP. OVER 100, 6 DAYS. HIGH 103°. *Case 4 Died: 1 case 2 Died: 1 case 5 Died.

OF THOSE IN MEMB. INTACT 3 HAD TEMPS. 14 (1), 16 (2) DAYS OVER 100--HIGH TEMP 102.

OF THOSE IN MEMB. RUPT. 1-12 hrs. 6 HAD TEMPS. 11 (4) DAYS. 9 (4) DAYS. 7 (1) DAYS TEMP. OVER 100 HIGH TEMPS. REPR 101-102° 101-101°

OF THOSE IN M.R. 12-24 hrs. 1 HAD TEMP OVER 100. 27 DAYS--HIGH TEMP 104°--M.R. 24-84 hrs. 2 HAD TEMPS. OVER 100. HIGH TEMPS 101-101°

PART 2

CAESAREAN SECTIONS WITH APPENDECTOMIES. COMPARED WITH PART I.

BEFORE LABOR	52				10	43.4	1.6	11	47.7	3.16				2	8.6	3				2.7
MEMBRANES INTACT	20	3	15.	0	8	30	3	6	40.	5.8	2	10.	4				1	5	16	4.6
MEMBRANES RUPT.	25	1	4.	0	9	36.	4	7	28	3.8	2	16.	7.5	2	8	6.5	2	8	15.5	5.7
TOTAL APPENDECTOMIES	20	2	10.	0	6	30.	3.1	6	30	4.8	3	15.	6.3	1	5	4				3.8
APPENDECTOMIES CLASSIFIED REPORT.	6				2	33.3	1.5	3	50	2.3				1	16.6	4				2.5
MEMBRANES INTACT	5				2	40.	2	2	40	8.5	1	20.	4							5
MEMB. RUPT. 1-84 hrs.	9	2	22.2	0	2	22.2	6	3	33.3	4.6	2	22.2	7.5							4.5

1 CASE 39 LABOR !! 96 hrs. M.R. ? HIGH TEMP 99° ++ 2 HAD 2 VAGINALS each
CASE 54 LABOR 39 hrs. M.R. 80 HOURS. HIGH TEMP. 100

10 days. *A priori*, we should expect a more stormy convalescence for the third group than the others; we believe this anomaly is explainable on the ground that their labors averaged a less intensity of contractions; as a result the by-products of forced metabolism were not so actively produced. In consonance with this we find that in the second group, the pulse rate averages high, the sequence of hard labor.

Further, these charts, Nos. 4 and 5 show in Groups 1 and 3 (membranes ruptured 1 to 12 hours, and 24 to 84 hours) the marked influence of the terminal temperatures of the patients who died; in Group 1, Case 5 died on the fifth day with a temperature of 104° which affected the average; then to continue the elevated rate four patients, Nos. 24, 50, 58, and 81 had a sharp transitory rise, even to 105°. In the third group, the terminal temperature of 82° brought

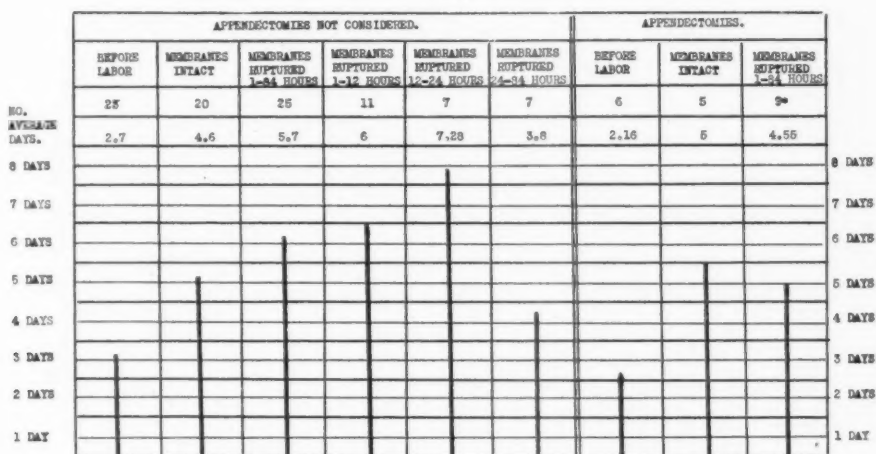
the curve up and was continued elevated by the fact that four patients on the sixth day had a temporary rise; the curves for the pulse rates showed a comparable course.

Do vaginal examinations increase the jeopardy of a woman who is about to have a cesarean section? It is manifestly impossible to eliminate all other factors which may unfavorably influence the welfare of the patient, and picture clearly the effects of vaginal examinations. Of our 92 cases, 58, i.e., 63 per cent, had no vaginal examina-

CHART 8

DIAGRAMMATIC PRESENTATION

DOES APPENDECTOMY INFLUENCE THE CONVALESCENCE IN CESAREAN SECTION?
DAYS OF MORBIDITY. TEMPERATURES OVER 100.



tions in relation to the labor; examinations were made on 29 patients, (33.7 per cent). Five records contained no statement pertinent to this point. In the first thirty-two cases (up to April, 1912) 50 per cent of the patients had vaginal examinations. In the last 10 years, out of 60 patients, 42 had no examinations (70 per cent). In eight patients there were two to five examinations in each, an average of 3+ for each. In every instance these repeated examinations were made before my entry on the case; eight had one examination each, in most instances done by myself, as the women were not seen before labor. We believe one of the factors which contributed a higher temperature in the diagrammatic presentation, Chart 3, for cases with membranes ruptured 1 to 12 hours than for 12 to 24 hours is, that among the former there were 81.8 per cent subjected to vaginal examinations against 14.2 per cent in the second period. The fact that the third period (24 to 84 hours) showed a reduction in temperature elevation in spite of 71.4 per cent of women having

such examinations makes it probable their types of labors did not break down their bodily resistance to bacterial invasion.

The fact that those patients subjected to vaginal examinations whose membranes were ruptured had a lesser temperature reaction and a better pulse rate than those who were not subjected to this examination must be explained only on the assumption that other factors influenced the convalescence—data which are not available. However, we cannot too strongly urge the fact that repeated vaginal examinations do have their evil influence (Chart 4).

CONCURRENT OPERATIONS

In the course of these cesarean sections salpingectomy was done in seven instances to secure sterility; one woman had a single oöphorectomy for a small cyst; one woman had a double ovariectomy for ovarian cysts. One woman came to the section with the statement that at a previous operation, both tubes and ovaries were sacrificed, yet no evidence of any operation on the adnexa was found. Two patients had myomectomies. In consenting to the operation, the woman, Case 11, with the fibroid, absolutely refused to permit the hysterectomy, so the tumor was left; she stated that if she conceived once with the tumor she could again.

In 1912, Case 30 came to operation after four hours of labor, membranes intact, with no vaginal examinations. During my absence from town she developed a stormy period—at first symptoms were indefinite, but finally my colleague, Dr. N. M. Percy, convinced himself she had an acute appendicitis. After the delay in diagnosis it was deemed wiser not to operate. On the tenth day a sinus opened in the incision discharging a foul looking fluid, with fecal odor. She recovered without operation. About a year later a patient, No. 35 (1913) came for her second section, and asked that her appendix be removed as she was loath to return for another laparotomy. It was done; she had a temperature of 100.2° once on the following day and was in no wise disturbed by the additional procedure. In 57 cesarean sections the appendix has been incidentally removed 20 times (35.9 per cent). There has not been one demonstrable evidence of complication incident to the removal of the appendix. In the second patient, Case 37, where the appendix was removed, there was a febrile course for 14 days; she was in labor 50 hours, membranes unruptured, and had two vaginal examinations. We felt certain the clinical course was not compromised in any manner by the appendectomy. Appendectomies have not been done on women whom we felt should be placed in bed as quickly as possible, and where for any reason the prolongation of the operation was inadvisable. Under given circumstances, we feel there is the same justification, and the

same safety, in the removal of the appendix as in the course of any laparotomy. The average duration of febrility in the above 20 patients was 4.12 days; for those not in labor, the patients with appendectomies had roughly one-half day less elevation of temperature than those where it was not done; to offset this, appendectomies done in labor with membranes intact increased the febrility .4 of a day over the average; and was one and two-tenths of a day less than the average of those where the membranes were ruptured 1 to 84 hours. (Chart 7, part 2, and Chart 8.)

DELAYED CONVALESCENCE

In the first 37 cases the protracted thermal elevation continued for a period of 10 days or more (to 27 days) in 5 of the women—13.5 per cent. Since Case 37 (1913) four women had a delayed convalescence continuing 10 to 27 days, 7.2 per cent. Phlebitis occurred in one patient, No. 18, with one vaginal examination. An hemolytic streptococcal infection (Case No. 84) caused a most violent and alarming postoperative course for 16 days, excessively high, irregular temperature, chills, uterine hemorrhages, necessitating blood transfusions. At operation the placenta was found very firmly adherent—its removal exemplified the extreme difficulty which might be encountered in the manual removal of a placenta *per vaginam*. Also, there was a marked deciduitis, one plaque as large as the palm of the hand was loose and removed.

Stitch abscesses necessitating wet dressings were present in two cases; one other (No. 30) had the sinus which discharged a fetid, fecal fluid.

Postpartum hemorrhage occurred in two women.

The uterus was adherent to the abdominal scar in three instances; in one, after an automobile accident, the adhesion stretched into a long dense string; on account of repeated ileus the abdomen was opened. Of the repeated sections, one had no vestige of the uterine scar; in another the scar was hardly visible. Five had a number of small adhesions to the uterus or abdominal scar or both. In three the adhesions were very dense and diffuse.

CONCLUSIONS

1. The adoption of modern surgical principles has been the greatest means of reducing the risks of a cesarean section to the present minimal point.
2. The second great factor in lowering maternal mortality is the abstinence from vaginal examinations.
3. One of the most important contributions to the improvement in the safety of sections is the routine employment of rectal touch.
4. The eventual possibility of a section should be clearly and def-

initely determined in pregnancy. Every step in the subsequent conduct of labor should be subservient to this knowledge of potential difficulty.

5. An absolute pelvic deformity demands that the woman should have her section before labor sets in and at a set hour.

6. Conversely, unless there be imperative necessity, the woman with relative disproportion should be given an adequate test of labor.

7. The test should be so reasonably prolonged that there is neither the facies of exhaustion, nor an abnormally high pulse rise or temperature elevation.

8. The prolonged rupture of the membranes certainly has a very deleterious effect upon a woman in labor; if labor be unduly prolonged after the rupture a stormy convalescence is probable in 10 or more per cent, and the lethal outcome for the occasional woman is certain to occur.

9. A slow, long labor with weak, irregular, aberrant contractions, is not so dangerous if a section be performed as a shorter, but violent type of labor.

10. A hard labor in all probability liberates protein bodies, or other by-products of forced metabolism which are inimical to the convalescence of the woman subjected to cesarean section, possibly with the destruction of her immunity.

11. A cesarean section performed before labor spells almost certain success in skilled hands with a minimum of physical distress.

12. Labor increases the physical distress, and may jeopardize the convalescence.

13. Above all things, prolonged labor, with prolonged rupture of the membranes, with vaginal examinations, or futile attempts at delivery from below, spells disaster.

14. Cesarean section is far more dangerous for the woman than spontaneous labor—even an operative delivery of some difficulty.

15. The sum total of discomfort, distress, malaise associated with cesarean section is as great or greater than the inconveniences and pain of labor; one certainly offsets the other.

16. The above facts, joined to the increased mortality demand that sections shall be done only for clear indications.

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PREGNANCY IN THE TUBERCULOUS. WITH THE REPORT OF 166 CASES*

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FROM the earliest medical records to the present time the subject of pregnancy occurring in the tuberculous has attracted attention. Many of the earlier observers believed that pregnancy exerted a favorable influence on the course of tuberculosis. This view was probably due to the fact that gestation tends to increase the weight of the pregnant woman. As early as 1862 Gassner¹ commented upon this finding. De Lee² states the increase in weight is the result of increased assimilation of the fetus and its appendages, the storing up of fat and albumin, the accumulation of water and the increase in the amount of blood.

The frequency of pregnancy in the tuberculous is well known. This fact has led some observers to conclude that the sexual appetite is increased in this disease. This, however, is doubtful. The fertility of the tuberculous is probably explainable on other grounds. In 1913 Bacon,³ estimated that 32,000 tuberculous women became pregnant annually in the United States. At present in the United States alone 65,000 women die annually of tuberculosis.

Pulmonary tuberculosis exerts no influence against conception and except in the end stages does not as a rule produce abortion. Excessive coughing and marked toxemia do in some cases contribute to abortion or premature delivery, but in our series this has not been a marked feature.

As the treatment of tuberculosis in the pregnant woman involves the question of whether or not the pregnancy shall be terminated, three important points must be considered. (1) Does pregnancy act deleteriously upon the course of pulmonary tuberculosis? (2) Does the termination of pregnancy benefit the patient? (3) What will be the condition of the infant if pregnancy is allowed to go to, or nearly to term?

Regarding the first question of whether or not pregnancy acts deleteriously upon the course of tuberculosis, it may be said that a careful analysis of the literature shows an overwhelming opinion in the affirmative. A few isolated opinions to the contrary are on record. In studying this point it should be recognized that it is a question of

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percentages, all patients do not do badly, and a positive opinion should not be based upon the observation of only a few cases.

Furthermore end results should be studied. The majority of reports in this literature are by obstetricians and not by internists. The obstetrician is likely to see the most unfavorable cases. The majority of women are delivered by the general practitioner or midwife and doubtless many mild cases are not recognized, or are treated in the usual manner. If, however, the case does badly it is likely to be referred to a maternity hospital, or consultation is secured, and this to some extent accounts for the fact just mentioned. The following tables represent the results in one hundred and sixty-six (166) cases. In each of these, tuberculosis was positively diagnosed clinically, and the diagnosis in each case was confirmed by the demonstration of the tubercle bacillus. Each case was followed for at least three months subsequent to the termination of the pregnancy and many were observed for a period of years. The majority of these cases are from the Henry Phipps Institute in Philadelphia and constitute the average run of ambulatory patients. The percentage of early cases is probably rather high as all pregnant women applying to our prenatal department are subjected to a thorough examination by an internist especially skilled in the diagnosis of tuberculosis.

TABLE I

RESULT IN 166 CASES OF PULMONARY TUBERCULOSIS COMPLICATED BY PREGNANCY

Each case followed for 3 months after termination of pregnancy		
Total number	166	percentage
Pulmonary condition		
Improved	30	18
No change	62	37
Worse	64	38
Deaths*	10	6
Pregnancy interrupted (therapeutic abortion)	7	3
Premature labor (spontaneous)	4	2
Abortion or miscarriage (spontaneous)	6	3
Infants stillborn	4	2
Infants dead	28	16
Infants alive 3 months of age	120	72

*All maternal deaths due to tuberculosis.

The combined statistics of twenty-five authors as found in the Index Medicus from 1915, show that from 50 to 94 per cent of pregnant tuberculous women become worse as a result of their gestation. The combined averages of this large series show that in 64.64 per cent of cases, the pulmonary lesion became worse or ended fatally. In this connection it should be remembered that many of the cases in these series were not followed after the termination of their pregnancy, and if this had been done a greater morbidity and mortality would almost certainly have been observed.

TABLE II
ANALYSIS OF CASE-RECORDS OF 104 WOMEN, 18 TO 38 YEARS OF AGE (INCLUSIVE) NONPREGNANT WITH POSITIVE DIAGNOSIS OF PULMONARY TUBERCULOSIS COMPARED WITH THE PREGNANT SERIES

NONPREGNANT		PREGNANT	
Cases from the Henry Phipps Institute		Cases from the Henry Phipps Institute	
Improved	45.3%	Improved	18%
No change	29%	No change	37%
Worse or dead	34.7%	Worse or dead	44%
From the Prudential Insurance Co. of America		Entire series 69,500 cases (American and Canadian reference 1909-1919)	
Improved	43.8%	Improved	24%
No change	21%	No change	19.2%
Worse	19.2%	Worse	12.5%
Dead	12.5%	Dead	12.5%

TABLE III
ANALYSIS OF PREGNANT AND NONPREGNANT CASES OF PULMONARY TUBERCULOSIS

NONPREGNANT		PREGNANT	
Phipps Institute in 104 cases		Prudential Ins. Co. in 69,500 cases	
Stage 1		Stage 1	
Improved	32	Improved	18
No change	19	No change	29
Worse	19	Worse	20
Deaths	0	Deaths	1
Total	70	Total	68
Improved	45%	Improved	26%
No change	27	No change	42
Worse	27	Worse	29
Deaths	0	Deaths	1.5
Stage 2		Stage 2	
Improved	8	Improved	11
No change	9	No change	35
Worse	10	Worse	34
Deaths	2	Deaths	3
Total	29	Total	79
Improved	27.5%	Improved	14%
No change	31	No change	39
Worse	34	Worse	43
Deaths	6	Deaths	3.6
Stage 3		Stage 3	
Improved	1	Improved	1
No change	0	No change	2
Worse	1	Worse	10
Deaths	3	Deaths	6
Total	5	Total	19
Improved	20%	Improved	5%
No change	0	No change	15
Worse	20	Worse	53
Deaths	60	Deaths	31.5
Total	104	Total	166

To determine the actual deleterious action of pregnancy upon the tuberculous woman the foregoing figures should be compared with a series of nonpregnant tuberculous women of similar ages, living under similar conditions and studied for the same period of time. For this purpose we have analyzed one hundred and four (104) cases from the out-patient department of the Henry Phipps Institute with the results shown in Table II.

These tables offer merely general figures. The results of a more careful analysis of our cases, dividing them according to the advancement of the pulmonary condition, when first observed, is shown in Table III.

Laryngeal Tuberculosis.—Practically all authors agree regarding the extreme gravity of laryngeal involvement. Five of our one hundred and sixty-six (166) cases developed this complication. Three died and the remaining three were in poor condition when last heard from. Fellner's and Lobenstine's combined statistics report 520 such cases in which the mortality was 65 per cent.

From the study of these numerous large series of cases of pregnancy in the tuberculous, it seems hardly possible for the unbiased observer not to be impressed with the fact that pregnancy exerts a deleterious influence upon a considerable proportion of cases. This being the case, our second question of what benefits may be hoped for by the termination of the gestation, becomes of importance. Medical opinion varies largely upon this point and many factors must be taken into consideration. In our series, therapeutic abortion has been performed seven times, too small a number from which to draw conclusions.

On the other hand the study of the remaining cases is of value. In the entire series 20 appeared improved and 62 exhibited no marked change as a result of their pregnancy, thus 49 per cent were no worse off after the pregnancy. A study of 674 cases collected from the literature (Funk,⁵ McSweeney,⁶ Mosher,⁷ Nobecourt,⁸ Sachse,⁹ and Walsh¹⁰) shows that no operative intervention was practiced in 630 and therapeutic abortion was resorted to in 44. Deterioration without operative intervention was observed in 44 per cent as against deterioration with operation in 9 per cent.

Infant Mortality.—Whether or not the infants of tuberculous mothers are constitutional weaklings or whether they exhibit a hypersusceptibility to tuberculosis is not definitely settled. The weights of all the infants from our series are not available, but such as have been studied do not show a marked decrease from the average. The author has observed large, fat, apparently healthy infants born of mothers in the last stages of the disease. It is probable, however, that in a large series of cases the infants would be found to weigh slightly less than the average and to be less vigorous, as would a

series from mothers whose health was depleted from any other chronic wasting disease. In a series of over 1500 infants collected from the literature by fourteen authors, the infant mortality was 58.83 per cent. Doubtless invalidism on the part of the mothers, or an actual motherless condition, bottle feeding and operative intervention during labor, greatly influence the mortality. In our own series of 166 cases 120 infants were alive three months or more after delivery, showing an infant mortality of 27.7 per cent.

Congenital Tuberculosis is so rare that it may be regarded as a medical curiosity. A careful search through the literature shows but 13 positive cases.⁴ Tubercle bacilli in the placenta and actual placental tuberculosis are less rare, but are still so infrequent as to be almost negligible factors. The relatively high percentage of tuberculosis which has been observed in the children of tuberculous parents is the result of postnatal infection and can be prevented by proper prophylactic measures.

Some of the material utilized in this report has been previously employed by one of the authors. In a further study of our cases we have not changed our opinion regarding their treatment. We believe that had pregnancy been terminated early, in a greater proportion of cases the results would have been better. Some of our patients refused operation and others came to us too late to benefit by such treatment. In our work we have perhaps erred on the side of conservation, but taken as a whole believe the results compare favorably with those reported by other authors. In conclusion the authors wish to take this opportunity to extend thanks to the medical staff of the Henry Phipps Institute, especially to Dr. H. R. M. Landis and Dr. Isadore Kaufman, as well as to the efficient work of the Social Service department of the same institution. The intelligent work of the latter has been the means of saving many infants.

CONCLUSIONS

1. The combination of pregnancy and pulmonary tuberculosis is a common one.
2. Pulmonary tuberculosis exerts little or no influence against conception.
3. Pulmonary tuberculosis exerts but little influence on the course of pregnancy, and except in the advanced stages exerts little or no influence toward causing abortion, miscarriage, or premature labor.
4. About 20 to 30 per cent of mild, quiescent pulmonary tuberculosis and 70 to 90 per cent of more advanced cases exhibit exacerbations during pregnancy or the puerperium.
5. Marriage is worse for the tuberculous woman than for the tuberculous man owing to the dangers incident to pregnancy.

6. Unless the pulmonary lesions have been quiescent for a moderately prolonged period, tuberculous women should not marry.

7. Tuberculous women should not become pregnant unless the disease is in the first stage, and has been quiescent for a minimum period of two years.

8. It is as yet impossible to determine with certainty which case will bear the added strain of pregnancy well and which badly. We must individualize our patients. Moderately extensive lesions, extension, especially laryngeal involvement, loss of weight, fever, hemorrhage, sweats, lack of vigor, inability to obtain proper treatment are ill omens, whereas the reverse are more favorable.

9. Prior to the fifth month of pregnancy, the uterus should be emptied if the disease manifests any evidence of becoming active. Curettage during the first six or eight weeks, and in the latter cases vaginal hysterotomy are the preferable methods. Regarding the latter method, while it is preferable from an operative standpoint, it must be remembered that abortion can be induced without a general anesthetic, whereas one is usually required if a vaginal hysterotomy is performed and sometimes the latter fact will outweigh the advantages of the former.

10. About 65 to 70 per cent of suitable cases will be benefited by this treatment provided it is employed as soon as acute symptoms arise and provided that proper after-treatment is instituted. Late intervention, that is, after a week or more from the onset of the exacerbation, has given less satisfactory results.

11. Sterilization is not justifiable as a routine procedure. Here again the patients should be individualized. Furthermore as a routine procedure it is not advisable as in many cases it will be more expedient to empty the uterus without an anesthetic. Sterilization involves opening the peritoneal cavity and usually requires a general anesthetic. Apart from the dangers of a general anesthetic, sterilization prolongs the operation and generally adds to the gravity of the same. If the case is in such a condition that she is going to do badly it is useless. If as a result of emptying the uterus she improves, it is better to perform the sterilization at a later date when she is in better condition.

12. After the fifth month of pregnancy, it is generally advisable to treat these patients expectantly. Labor should be made as easy as possible. For this end, induction of premature labor two weeks before term may be advisable, rarely, if ever, should they be allowed to go beyond term. At labor, forceps or version is often indicated.

13. Infants should not nurse from tuberculous mothers, and should be especially guarded from infection.

14. Hygienic and dietary treatment should be employed at all

times. These patients should be kept under close observation and should be examined by a competent internist at regular and frequent intervals.

15. In the great majority of cases the tuberculosis precedes the pregnancy. Even in those cases in which the symptoms are first observed during pregnancy, infection has generally occurred prior to conception and an exacerbation during pregnancy has directed attention to the pulmonary condition.

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(For discussion, see p. 668.)

FURTHER EXPERIENCE WITH PITUITARY EXTRACT IN THE INDUCTION OF LABOR*

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TWO years ago I presented to this Society a communication† in which I gave an analysis of one hundred and fifty cases of induction of labor, in the majority of which pituitary extract had been the inducing agent. Since then we have had a larger series of cases the results of which I now wish to record.

As in the first series of cases already recorded we have used quinine and pituitary extract as the routine method of induction in the majority of cases, but sometimes quinine alone has been sufficient and in a considerable number pituitary alone has been used. Our routine procedure in the public wards is as follows:

- | | |
|------------------------|-------------------|
| 1. Castor oil | oz i at 6 p. m. |
| 2. Quinine hydrochlor. | grs x " 7 p. m. |
| 3. Enema | " " 8 p. m. |
| 4. Quinine hydrochlor. | grs. x " 9 p. m. |
| 5. " " " | " x " 12 midnight |

If labor pains do not begin by 9 A.M., i.e., 14 hours after the first dose of quinine, pituitary extract $\frac{1}{2}$ c.c. is given intramuscularly. If labor pains begin, no further dose is given, but if there is no result or if the pains initiated by the drug begin to pass off the pituitary extract is repeated in half an hour. Further doses at half hour inter-

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vals are given, up to a total of six doses if necessary. If labor is not then definitely begun treatment is stopped and a similar attempt with pituitary is made the next day and if necessary the day after that.

Where pituitary extract alone is used the routine is as follows:

1. Enemata till the rectum is clear at 6 A.M.
2. Pituitary in $\frac{1}{2}$ c.c. doses as above, beginning at 7 A.M.

In cases where we have failed to induce labor by these means we have used bags or bougies and in a few instances have used these as the initial procedure.

Since my last communication we have had a series of 128 cases of attempted induction in the public wards of the Toronto General Hospital. I have had 54 in private practice, and Dr. W. A. Scott, a member of my Staff, has had 94 in his practice. The results of these he has kindly placed at my disposal. He has used the same method as above outlined. This gives a total of 276 cases.

The indications for induction in these cases were as follows:

Pregnancy prolonged beyond term.....	154
Pregnancy toxemia and eclampsia.....	51
Small pelvis or large child	38
Distress or discomfort before or at term.....	30
Antepartum hemorrhage.....	10
Glycosuria	2
Asthma	1

It will be noted that the chief indication has been postmaturity. We believe that, when a pregnancy has continued more than ten days or two weeks beyond the calculated date of labor, induction is indicated. We do not hesitate to use pituitary extract in cases of pregnancy toxemia with high blood pressure, as Dr. W. W. Lailey, a member of my Staff, carried out a series of observations and found that the blood pressure was never raised more than five points by a single dose of pituitary extract and that subsequent doses did not raise it any higher. We have frequently used it to start labor in the presence of actual convulsions. A word may be said about the fourth indication—distress or discomfort shortly before or at term. These patients had abdominal pain, backache and inability to walk, sleeplessness and general malaise lasting over several weeks. Such cases are not uncommon in obstetrical practice.

Of the ten cases of antepartum bleeding four were placenta previa and six were cases where there was very slight bleeding without abdominal pain or uterine tenderness, with the placenta in its normal position.

The following table gives the results of the different forms of induction:

METHOD OF INDUCTION

	TOTAL CASES	NO. OF FAILURES	PER CENT OF SUCCESSES
Castor Oil and Quinine	55	*	
Castor Oil, Quinine and Pituitary	130	13	90
Pituitary alone	65	6	90.7
Bags and Bougies	33†	2	93.9

*These were all successful, but in the 130 cases where pituitary had to be used there was no result from the quinine alone.

†In seven of these quinine and pituitary had previously failed.

It will be seen from the above table that out of a total of 195 cases in which a combination of quinine and pituitary or pituitary alone was used, labor was successfully induced in 176 or 90 per cent.

In 146 cases or 75 per cent, labor began as the result of one routine induction, the average number of doses of pituitary extract each patient received being 3.2. There remained 49 patients in whom labor did not begin. In eight of these no further attempt at induction was made, leaving 41 who underwent a second routine induction with pituitary extract. In 23 of these or 56 per cent, the second attempt was successful, the average number of doses of pituitary extract being 2.8. In 5 of the 18 unsuccessful cases no further attempt at induction was made, leaving 13 who underwent a third routine induction with pituitary extract. In 10 of these or 77 per cent, this third attempt was successful, the average number of doses of pituitary extract being 3. In 49 of the cases the induction was carried out at from four weeks to one week before term. In these premature cases the number of successes was 37 or 75.5 per cent, showing, as we would expect, that induction is more difficult before than at or after term.

MATERNAL COMPLICATIONS

In the series of cases recorded there were no maternal deaths. In two cases, both elderly primiparae, there was considerable shock following the third stage with an excessive amount of hemorrhage. Both required stimulation and saline interstitially, but made good recoveries. Both labors lasted about twenty hours and were completed by forceps. Pituitary as a possible cause of the condition cannot be excluded, but it is one which we have all met with in cases where pituitary has not been used.

In one case the first dose of pituitary set up severe vomiting and the induction was not proceeded with further.

All patients were examined vaginally from ten days to two weeks following delivery and in none was there any laceration of the cervix of such degree as to demand repair.

In two cases there was retention of the placenta in the third stage. Both required manual separation and extraction. They both had more hemorrhage than usual, but made good recoveries. In one case severe

hemorrhage followed the first dose and revealed a central placenta previa hitherto unsuspected. She was delivered immediately by cesarean section.

INFANT MORTALITY

In the series of 195 cases in which pituitary extract was used there were ten stillbirths and two children died within three days of delivery. This gives a fetal mortality of just over 6 per cent. The general fetal mortality for all cases in the hospital for the past six months is 6.5 per cent. The causes of fetal death were as follows:

Hydrocephalus	2
Anencephaly	1
Atelectasis	2
Cerebral hemorrhage	3
Eclamptic toxemia	2
No autopsy	2

The cases of hydrocephalus and anencephaly call for no comment. One of the cases of atelectasis was a child presenting by the breech and delivered with difficulty. It died on the third day. The other was born after a slow labor in a very stout primipara who had gone two weeks past term. It died twenty-eight hours after birth.

One of the three cases of cerebral hemorrhage was in a child delivered by the breech. One was delivered by low forceps. The labor in this case was induced two weeks before term on account of severe glycosuria in the mother which was unaffected by treatment, but which cleared up after delivery. The remaining case of cerebral hemorrhage was a child born after an easy labor.

In the two cases of stillbirth ascribed to pregnancy toxemia the children had died *in utero*, one 48 hours and the other three days before delivery. In both cases two attempts to induce labor with quinine and pituitary had been made prior to the death of the children. In one case labor was ultimately induced with bougies and in the other a further two doses of pituitary extract were successful. In both cases the placentae were much infarcted. Possibly both these children might have been saved had the first induction been successful or bags used as soon as the failure of pituitary became apparent. These were the only two children lost in 51 cases of toxemia which underwent induction.

To sum up, in the 195 cases of induction of labor in which pituitary extract was used as the inducing agent 90 per cent were successful. The maternal mortality was nil. There were no cases of laceration of the cervix and no greater proportion of pelvic floor lacerations than in ordinary labor. There were two cases of retained placenta and two cases of rather severe hemorrhage accompanied by shock follow-

ing the birth of the placenta. Both of the latter were primiparae over 39 years of age. I submit that the number and nature of these complications is no greater than would be met with in a like number of deliveries where no pituitary had been used.

There were 12 fetal deaths, giving a fetal death rate of just over 6 per cent. Three of these children were monsters. Two died in utero apparently from placental infarction due to pregnancy toxemia. Three died of cerebral hemorrhage, two died of atelectasis within three days of birth and in two no autopsy could be obtained to ascertain the cause of death. Taking into consideration the nature of the cases in which induction was carried out I think that the results so far as fetal death rate is concerned compare favorably with those obtained by any other procedure.

A great deal has been said and written about the bad effects on the mother resulting from the administration of pituitary extract in the course of labor. I am convinced that practically all of these are the result of the wrong administration of the drug. Pituitary extract should be used in the course of labor for one purpose and one purpose only, viz., to stimulate uterine contraction when this is markedly inadequate and where we are absolutely satisfied that given adequate contraction there is no possible obstruction to the passage of the child. To give pituitary to a patient with a rigid cervix or in a case of delay due to a small pelvis, large head, malposition of the head or rigid pelvic floor is to court disaster. Cases of rupture of the uterus and fetal death are bound to occur if it is used in such cases, but this is no argument against its use in the properly selected cases.

When given to induce labor the initial dose is $\frac{1}{2}$ c.c. If there is any idiosyncrasy on the part of the patient to the drug it is revealed at once as in the case cited where severe vomiting resulted. Administration can then be stopped. Our experience shows that if the first dose produces no bad effects subsequent doses will be equally well borne as the drug has no accumulative effect. In our experience the initial contractions induced have never been of a severe tonic nature. The first contraction is usually longer than the succeeding ones, but these latter are of the nature of ordinary labor pains. In most cases these begin to die away in fifteen or twenty minutes and must be kept going by a further dose. If contractions can be kept up sufficiently long, if necessary by further doses, to start dilatation of the cervix and separation of the lower pole of membranes, the labor will thereafter go on naturally.

There is only one specific criticism of the method which I shall mention, viz., that contained in the Practical Medicine Series for 1921. There, the Editor, after reviewing my first communication states that

he "believes it more than possible that a man could recover damages at law for the loss of wife or child, if it were shown that pituitrin was administered before delivery." That, I hold is not a fair criticism. It is a statement which may involve many practitioners in costly law suits and is certainly not calculated to stimulate research along new lines in medicine.

(For discussion, see p. 660.)

THE ACTION OF ERGOT AND SOLUTION OF HYPOPHYSIS ON THE UTERUS*

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PROBABLY from observing the effects in the epidemics of ergot poisoning which were formerly so common in Russia and Germany, the uterine action of the drug was discovered many years ago. This action must have been utilized clinically at some very early date; mention appears to have been first made of it by Lonicér¹ in 1565; but the utilization of ergot in obstetrics by members of the regular medical profession may be said to have begun with the appearance of Stearns' letter in 1808. Stearns² and many of his immediate successors in the advocacy of the use of the drug, recommended that ergot be employed, both to check or prevent postpartum hemorrhage and also to increase the force of the uterine contractions in the early stages of labor. Ryan,³ in 1831, expressed the view widely held at that time when he said of ergot: "In small quantities, it is a safe and valuable remedy, and has a specific effect on the uterus, exciting gradual but powerful contractions of that organ when the natural parturient action is diminished or has entirely ceased. It does not produce permanent contraction, but merely renews the labor pains and augments their force * * * (it) abridges human suffering which might continue hours and days unalleviated; it supersedes the use of instruments in many cases; and it saves the attendant much anxiety and useless loss of time." As late as 1882,⁴ it appears that ergot was still used extensively to increase the force of uterine contractions during the early stages of labor; and, indeed, in one of the best of the modern text books on pharmacology⁵ such use seems still sanctioned. The general consensus of opinion today among intelligent and conscientious obstetricians, however, is that ergot should never be administered before the expulsion of the placenta. As a conse-

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quence of a century's trial by the medical profession, the conclusion has been reached that ergot is an unsafe drug to employ in the early stages of labor. "The firm contraction may hinder delivery and compress and asphyxiate the fetus; even rupture of the uterus has been reported." That such results always follow the use of ergot is a ridiculous assumption; their absence in the wide experience of men like Ryan and Dewees⁶ disproves it; but because such disasters may occur, the early administration of ergot has rightly been abandoned.

Following the demonstration of the action of the extract of the posterior lobe of the pituitary gland on the uterus of lower animals, Bell,⁷ in 1909, suggested its use to stimulate the contractions of the human uterus. In certain sections of the country this drug enjoys an enormous popularity; many practitioners employing it as a routine in their obstetrical practice. Those enthusiasts⁸ who recommend the administration of pituitary extract in the early stages of labor contend that its action is essentially different from that of ergot; the latter drug may occasionally lead to a tetanic contraction of the uterus with the baneful results that have been mentioned, but pituitary extract, while increasing the force of the individual contractions, does not disturb the normal relationship between relaxation and contraction. It is difficult, to say the least, to obtain positive evidence in support of this contention; probably it is based on "clinical impressions" similar to those which led Ryan to make the same statements in regard to ergot. Elsewhere⁹ we have shown that pituitary extract, even in minimum doses, may cause an increase in the tonicity of the human uterus which, in its effect on intrauterine pressure, is identical with that produced by a tetanus. In the present paper the results of a more extended comparison of the action of ergot and pituitary extract on the uterus, both of lower animals and of women, are reported.

The preparations used have been solutions of the posterior lobe of the pituitary gland of four different manufacturers, three fluidextracts of ergot of three different manufacturers, and two special preparations of ergot. All of the samples of pituitary solution were of recent date of manufacture, had been assayed physiologically, and appeared to be of about the same strength, as judged by their effects on the isolated uterus. Two of the fluidextracts of ergot and the special preparation were also fresh preparations; the third sample of the fluidextract was at least four years old, having been in the laboratory for that length of time. All of these ergot preparations, as will be shown in the tracings, were capable of causing contraction of the uterus of lower animals when administered in sufficient dose; as judged by the uterine effect, there was no striking difference in the efficiency of the oldest and the newest, although we

found it practically impossible to establish definite quantitative relationship between the different preparations, a difficulty that Edmunds and Hale¹⁰ have already mentioned in connection with the uterus method for the assay of ergot.

In the laboratory experiments, cats and dogs were utilized. The drugs were tested on the excised uterus and also on the organ *in situ*. The excised uterus was suspended in warm, oxygenated Tyrode's solution; after securing a normal record, Tyrode's solution containing a definite concentration of the drugs was introduced. For the experiments on the organ *in situ*, the animals were decerebrated and given artificial respiration; the uterine movements were recorded by the method of Barbour.¹¹

The official dose of the fluidextract of ergot is 2 c.c.; that of the solution of hypophysis, 1 c.c. Of late, however, the tendency has been to administer the latter drug in a dose of $\frac{1}{2}$ c.c. or even less. The attempt was first made to compare the action of ergot and pituitary solution in this latter ratio; namely, 4 to 1 although it is probable that, clinically, ergot administered orally attains a less concentration in the blood than the smaller dose of pituitary solution administered intramuscularly or intravenously.

The first step was to ascertain the dose of the ergot which was capable of causing a tetanic contraction or a marked increase in the tone of the uterine muscle. It was found practically impossible to fix on any definite concentration or dose, because of the difference in the response of the uteri of different animals of the same species. As a rule, the intravenous injection of approximately the clinical dose, 0.04 c.c. per kilogram or a concentration of 1 to 10,000 did not uniformly have striking or persistent effects. For the intact uterus, it was necessary to use a dose of 0.1 c.c. per kilogram; and for the excised uterus, 1 to 1,000 produced the most desirable action. The tracings in Fig. 1 illustrate the tetanic action of ergot on the cat's uterus *in situ*; while Fig. 2 shows a similar action on the uterus of a dog, *in situ*. Fig. 3 shows the effect of pituitary solution both upon the uterus and upon the blood pressure.

Decided effects were more easily elicited by pituitary solution. Thus, Fig. 4 illustrates the effect following the intravenous injection of 0.01 c.c. of pituitary solution per kilogram into a non-pregnant cat. In this animal the intravenous injection of 0.04 c.c. of fluidextract of ergot per kilogram produced only slight effects, the increase in tone passing off in 4.5 minutes after the first preparation and 6.25 minutes after the second; while after the injection of a fourth of this dose of a solution of pituitary, there was an enormous increase in tone, which persisted to the termination of the experiment some thirty minutes later. It is possible that the previous ergot injections

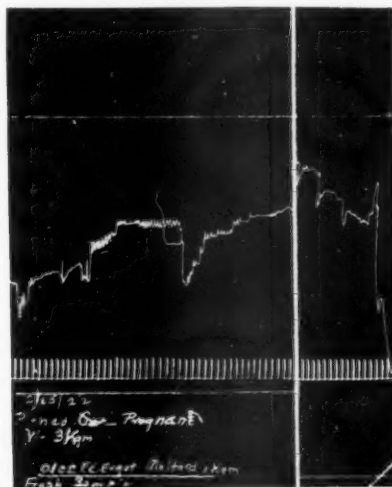


Fig. 1.—Pregnant cat; pithed. Persistent increase in tone-tetanus following the injection of 0.1 c.c. of fl. ext. ergot per kilogram. Uterus did not relax until more than fifteen minutes elapsed after injection. Note the large dose necessary to produce this effect. Time intervals, five seconds.

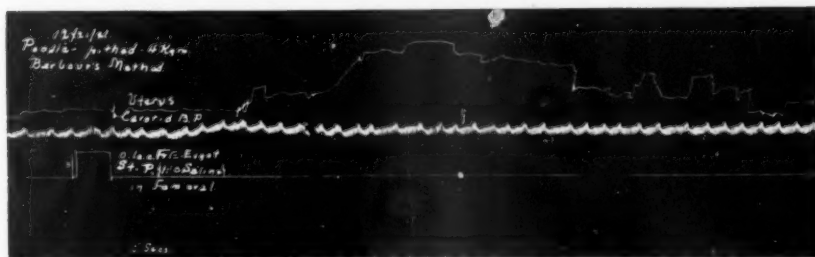


Fig. 2.—Nonpregnant dog. Record of blood pressure and uterine contractions. Injection of 0.1 c.c. fl. ext. ergot per kilogram caused a tetanus of the uterus persisting 3.6 minutes. Slight rise in blood pressure.

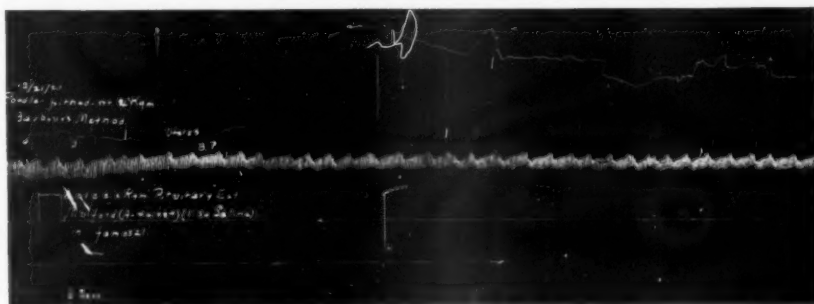


Fig. 3.—Nonpregnant dog, pithed. Injection of 0.01 c.c. pituitary solution, caused a tetanus which persisted 35 minutes, when the experiment was discontinued. Little effect on blood-pressure.

sensitized the uterus to the later action of the pituitary, Edmunds and Hale¹⁰ having noted an increasing irritability of the uterine muscle as a persistent effect of ergot injections. In the experiment illustrated

in Fig. 5, the order of injection was reversed, the pituitary solution being injected first, with the result that there was a marked increase in tone, persisting four minutes; while the subsequent injection of a thirty-two times larger dose of fluidextract of ergot caused a much smaller contraction, which passed off completely in three and one-half minutes. In one tracing are recorded the effects obtained simultaneously on the uterus of a cat *in situ* and a small portion of the uterus of the same animal excised. The larger dose of the ergot preparation caused less effect in both instances. In a nonpregnant dog, successive injections of a sample of fluidextract of ergot and one of pituitary solution were made. The ergot was given in a dose of 0.1 c.c. per kilogram; the dose of the pituitary solution was one-tenth this size. The increased tonus following the ergot injection persisted 6.25 minutes; the greater increase in contraction produced by the pituitary solution persisted over thirty minutes. In the tracing obtained from the intact

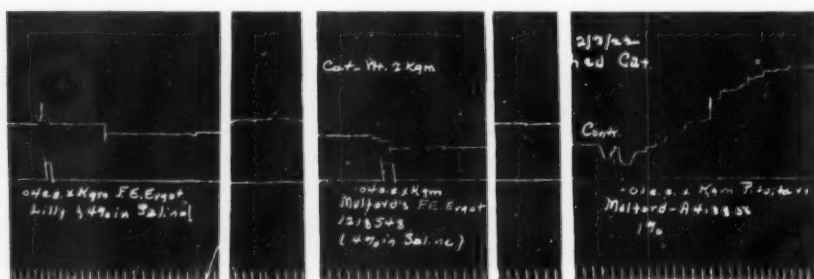


Fig. 4.—Pithed cat; nonpregnant. First injection of Lilly's fl. ext. ergot. Resulting maximum of contraction reached in 4.5 minutes, next injection of the same dose, i.e., 0.04 c.c. per kilogram. Mulford's fl. ext. ergot; resulting maximum contraction reached in 6.25 minutes. Last injection, 0.01 c.c. pituitary solution; contraction maintained 35 minutes.

uterus of a pregnant cat, the small dose of 0.5 c.c. of a 1:400 pituitary solution caused more striking and persistent effect than fluid extract of ergot in thirty-two times this dose. A segment of dog's uterus suspended in Tyrode's solution containing pituitary solution in the proportion of 1:2000, contracted more markedly than it did in the fluid extract of ergot in twenty times more concentrated solution.

From these experiments, it seems fairly safe to conclude that pituitary solution affects the uterus of cats and dogs more powerfully than ergot does. Instead of being devoid of the tetanizing action manifested by ergot, pituitary solution seems more prone to produce either a tetanus or an increase in tone which is similar in regard to its effect on intrauterine pressure. The indication is, therefore, that pituitary solution, instead of being safer than ergot when employed in the early stages of labor is actually more dangerous.

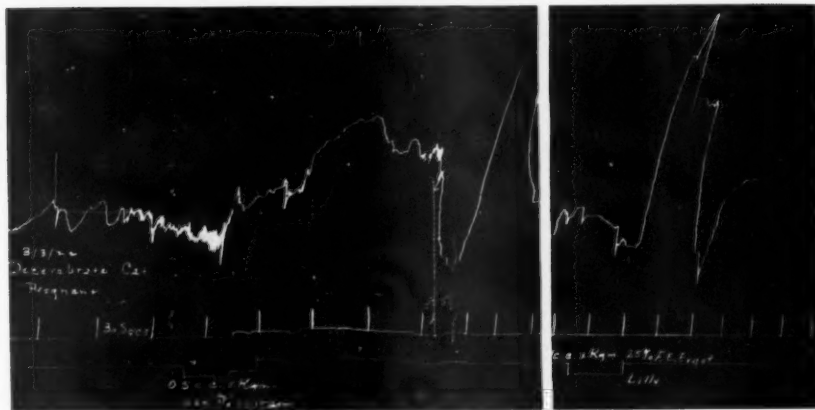


Fig. 5.—Pregnant cat, decerebrate. Time intervals 30 seconds. One-half c.c. of 1:400 pituitary solution per kilogram caused a much more pronounced effect than 32 times this dose of fl. ext. ergot. The pituitary effect persisted 4 minutes, that of ergot 3.5 minutes.

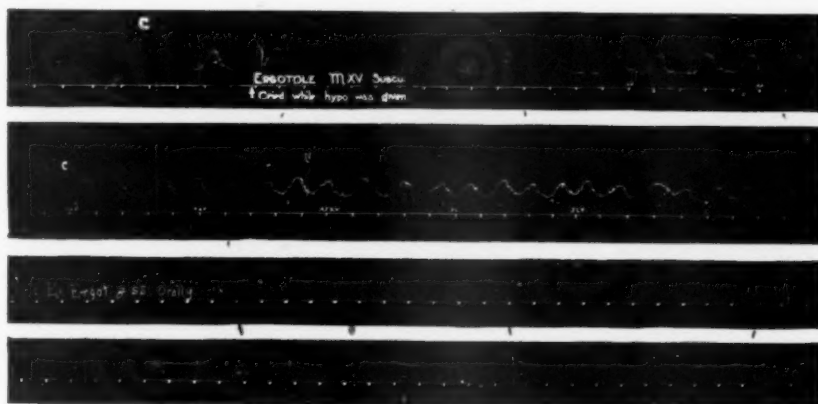


Fig. 6.—Patient at term and in first stage. In this and all subsequent records the timer marks minutes. Ergotole, 1 c.c. given at the point marked by arrow. Patient cried out at the prick of the needle and the consequent rise in intrauterine pressure shows on the record as an abrupt rise and fall in contrast to the regular rhythmic wave-like uterine contractions. The lines marked "c" are the result of an occasional cough. Note that after 20 minutes there was an increase in the rhythm, but there is a return to the base line after each contraction. The two tracings below are the records of another patient at term. She was given 2 c.c. of fl. ext. ergot with no demonstrable effect.

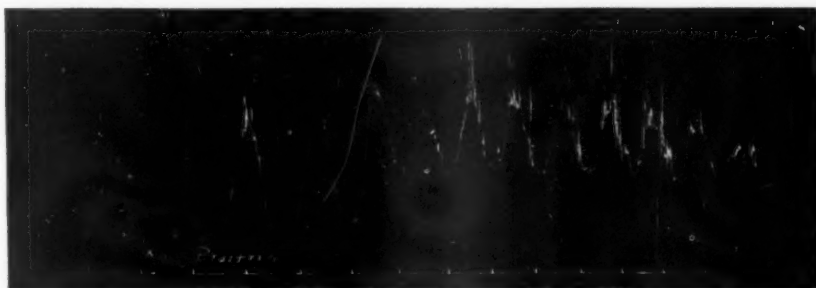


Fig. 7.—This patient was at term and late in the first stage. Pituitrin 0.12 c.c. hypodermically. In two minutes partial tetanus with superimposed waves of contraction. Perpendicular lines at the acme of pains are due to the straining action of the abdominal muscles.

There are some, however, who will advance the argument that results obtained on lower animals cannot be used as a basis for drawing clinical conclusions. The most direct answer to this argument is the presentation of clinical evidence in support of the statement that the human uterus is also affected as powerfully by pituitary solution as it is by ergot. In the paper already referred to,⁹ such evidence has been presented. In the earlier experiments, records of contractions of the human uterus were obtained by means of inserting a Voorhees bag into the cervical canal and connecting the bag with a mercurial manometer. Since it was possible to secure such records only during the first stage of labor, it was necessary to proceed with the utmost caution, using only very small doses in nearly all the cases. Later, by the utilization of the method of "external hysterography" suggested by Rùbsamen,¹² we have been able to secure records of

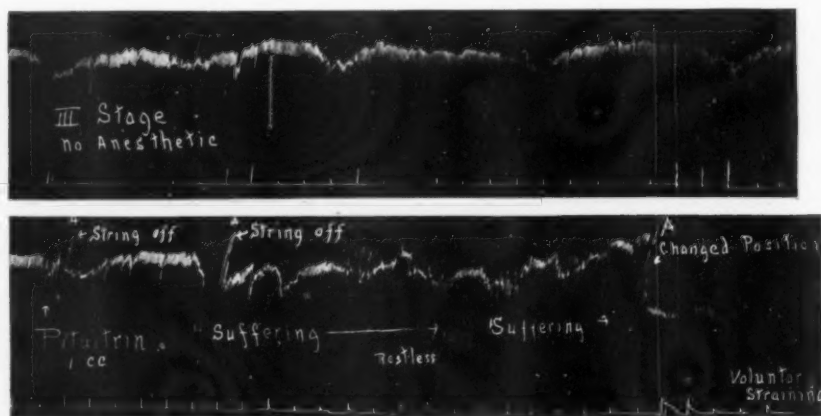


Fig. 8.—Tracing obtained in the third stage by Rùbsamen's method. Down strokes represent contractions, respiratory movements straight up-and-down lines, and the uterine contractions by broader waves every 7 or 8 minutes. Patient given 1 c.c. of pituitrin. Her struggles against the hypodermic threw the thread off the pulley. Six minutes after the injection marked contraction of the uterus and complain of pain. This persisted for $9\frac{1}{2}$ minutes and after a quiescent period of two minutes recurred for 5 minutes, but with less intensity. A indicates artifacts caused by the threads slipping off.

uterine contraction in the third stage of labor and after the expulsion of the placenta. All of the women were at term.

Fig. 6 shows the most marked effect of ergot preparations that we have been able to obtain in the first stage of labor. In the upper tracing, 1 c.c. ergotole was injected hypodermically at the point marked "T" and in the lower tracing, 3.75 c.c. of the fluidextract was given by mouth at the indicated time.

In our former work, the use of pituitary extract even in minute doses so uniformly produced partial tetanus, that we have not felt justified in repeating this work. For the sake of comparison, however, we wish to show one of our former tracings (Fig. 7). This was made by injecting hypodermically a multipara at term with 0.12 c.c. of

pituitrin. The latent period was scarcely two minutes and the uterus remained continuously contracted with superimposed waves of contraction for a period of 28 minutes.

In the tracings made by Rübsamen's method, down strokes represent contractions. A change in the height of the record above the base line does not represent a change in tone as might be thought at a cursory glance, but means a slight shifting of the patient's position. Rübsamen used kidney pads to immobilize the patients, but in our work we have simplified the apparatus as much as possible in order to enable us to set it up quickly after the birth of the baby. Fig. 8 shows the effect of injecting 1 c.c. of pituitrin hypodermically in the third stage of labor. Six minutes after the injection, there was a marked contraction of the uterus and the patient complained of



Fig. 9.—Record obtained shortly after the third stage. Fl. ext. ergot, 7.5 c.c., was given by mouth, with very little effect except a slight shortening of the interval between afterpains and an increased suffering on the part of the patient.

pain. This persisted for nine and a half minutes, and after a quiescent period of two minutes, recurred for five minutes, but with less intensity. The patient expelled the placenta by voluntary effort at the end of the record. When fluid extract of ergot 3.75 c.c. was given in the third stage, there was no demonstrable effect other than a slight diminution of the respiratory movements thirteen minutes after and again sixteen minutes afterwards.

The best time to study uterine contractions by "external hysterography," is just after the completion of the third stage of labor. The patient is well content to lie perfectly still, except possibly when she has an afterpain, and there are none of the necessary disturbances of the third stage, such as delivering the afterbirth, repairing lacera-

tions, etc. It is at this time that ergot is most generally used, and here too, it is generally conceded, lies a field of usefulness for pituitary substance. We have found that only multiparae are useful for demonstrating the action of these drugs for the reason that in primiparae the uterus remains firmly contracted and only the respiratory movements show on the records. Fig. 9 is a record obtained shortly after the third stage. This multipara was having afterpains approx-



Fig. 10.—Postpartum record. Patient given first 3.75 c.c. fl. ext. ergot by mouth and later 1 c.c. pituitrin hypodermically. Ergot seemed to cause a moderate increase in the frequency of the contractions while after the pituitrin they came in rapid succession.

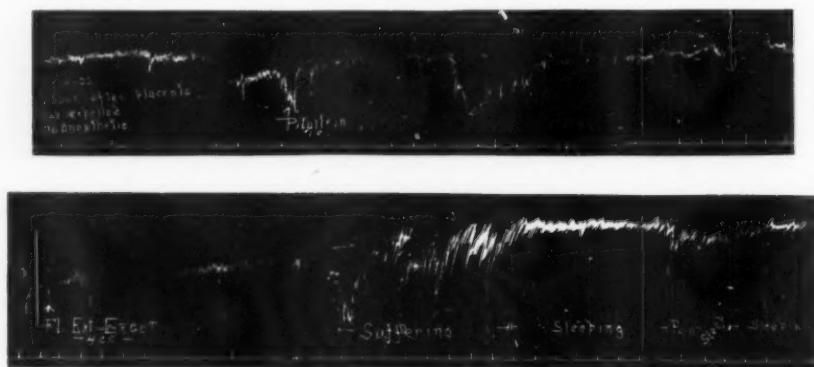


Fig. 11.—Postpartum record. Patient was given first pituitrin and then fl. ext. ergot. Depression three minutes before the pituitrin was given is caused by the patient shifting her position. The latent period of the pituitrin 8 minutes, contraction lasted 5 minutes. Latent period for ergot was 13 minutes and resultant contraction lasted 8 minutes.

imately every five minutes. She was given 7.5 c.c. of the fluidextract of ergot with very little effect except a slight shortening of the interval between pains and increased suffering on the part of the patient. Fig. 10 is another postpartum record upon a multipara. This patient was given first 3.75 c.c. of the fluidextract of ergot by mouth and

later 1 c.c. of pituitrin subcutaneously. The ergot seemed to cause a moderate increase in the frequency of contractions, while after the pituitrin the contractions came in rapid succession. In Fig. 11 the order of administration was reversed. The latent period here was eight minutes for the pituitrin and the contraction lasted five minutes. The latent period for the ergot was thirteen minutes and the resultant contraction lasted eight minutes.

COMMENT

In no case by the use of ergot did we elicit tetanic contractions of the uterus in human beings in the first stage of labor. This is at such a variance with what the accumulated clinical experience of a hundred years has led us to expect that we were at a loss how to interpret our results. At first, we were inclined to the supposition that the drugs used were inert, but this we disproved: first, by testing the same drugs upon animals, and second, by getting practically the same results with other lots of ergot. It is likely that there is a great deal of variation in the response of human uteri to both ergot and pituitary solution, and that the occasional existence of a uterus highly sensitive to these drugs accounts for the disastrous results that have followed their use. We have encountered such uteri not infrequently in our work with animals. Another explanation that may account for a certain number of cases is the sensitization of the uterus by repeated doses of ergot as was noticed by Edmunds and Hale. We have seen no such phenomenon in our observations upon human beings. In the laboratory, however, we have noticed a great variability in the response of the same uterus, the response sometimes being increased and sometimes being diminished by repeated doses of ergot.

Next to the ease and promptness with which a tetanic contraction of the uterus is elicited by pituitary solution, the most interesting feature of the action of this drug is the variation of the latent period. It has often been noted clinically that the effect of the solution of the hypophysis has been the more prompt and energetic, the closer the patient was to term. This has been borne out by our observations. When it has been necessary to induce labor in the seventh month, the latent period was four minutes, while at term we found it to be two minutes. In the third stage six minutes elapsed after the injection of the liquid before a response was noted, while after the delivery of the placenta, the latent period was found to be eight minutes.

CONCLUSIONS

It can be readily demonstrated by animal experimentation that the action of ergot and hypophysis solution upon the uterus are the same if large enough doses of ergot are used.

The action of pituitary preparations is much more powerful than that of ergot. This is readily shown both by experiments upon animals and by accurate observations upon human beings.

The action of both drugs varies greatly with different individuals. This is a common clinical experience and is abundantly substantiated by laboratory experiments.

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1600 PARK AVENUE.

(For discussion, see p. 660.)

INTRAUTERINE RUPTURE OF A VELAMENTOUS UMBILICAL CORD*

BY GEO. W. KOSMAK, M.D., NEW YORK, N. Y.

THERE is no gainsaying the fact that improvement in obstetrical methods and procedures has largely diminished maternal morbidity and mortality. Any one whose obstetrical experiences extend back over a period of twenty years can bear personal witness to the reduction in the number of serious obstetrical complications that are referred to a hospital for final delivery or treatment or are met with in consultation practice. But there is still a large group of fetal anomalies before which the obstetrician stands helpless. This includes mainly those accidents associated with fetal growth and development that cannot be detected in advance by any known methods that would result in the saving of the life of the child. Among these, attention may be directed to anomalies of the cord either in its development or in its accidental malposition, and it is to an example of this that I desire to call your attention.

CASE REPORT.—Mrs. M. F. E., aged thirty, married July 1, 1920. First consulted me on April 16, 1921, with a history of having had her last regular period January 23 to 28. She flowed slightly for two days in February. The patient's previous history was good. She appeared well nourished, inclined to corpulency and stated that she had gained twenty pounds since her marriage. It was difficult to map out the uterus by bimanual examination on account of the thick abdominal wall but a rather hard rounded mass was definitely palpable in the left adnexal region which was thought to be a tumor of the ovary or possibly a uterine fibroid. A month later the uterine enlargement was definitely palpable. There were no subjective signs of pregnancy noted, no morning sickness, no breast secretion. During the summer the patient began to notice swelling of the hands and feet and she felt life for the first time June 15th. The blood pressure was never above 140, but beginning with the first week of September the patient complained of constant drowsiness which bothered her to such an extent that she was unable to attend to her ordinary household duties. Aside from pyrosis no other symptoms were complained of. The urine at this time showed slight traces of albumin but no casts, with a depressed gravity and a corresponding relative amount of urea. The blood picture was normal. Intensive tingling in the hands and feet together with indefinite neuralgic pains made the patient very uncomfortable. The puffiness of the hands and the edema of the legs and abdominal wall became more marked and as no response followed ordinary dietetic and eliminative measures, I sent the patient to the Lying-In Hospital where, after a week's rest in bed with thorough catharsis, dietetic restrictions, colonic irrigations and hot packs, a rapid improvement occurred. The urinary picture at this time showed little change, slight to moderate traces of albumin and a low specific gravity with occasional granular

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casts. The blood pressure at this time began to go up slightly and varied from 146 to 150.

Although the pregnancy had been calculated as due about October 30, the patient at this time was evidently not over eight months. On November 15 I ordered two ounces of castor oil as a cathartic and also with the hope that labor might be induced, as the patient had become rather uncomfortable and the abdominal enlargement rather extreme. No pains resulted and the patient was quite comfortable after taking the oil. While engaged in playing cards about six hours after taking the oil she noticed a sudden discharge of blood, no pains were present. I saw her about an hour and a half later and found the bed clothes saturated and internal vaginal examination showed the vagina full with large clots. Patient's general condition was good although she appeared rather pale and the pulse was somewhat rapid. She stated that she had not felt any life since six o'clock. The cervix was rigid, high, thick, one finger dilated and no presenting part could be felt. The fetal heart was not heard. A tentative diagnosis of premature separation of the placenta was made and the patient was sent to the Woman's Hospital. Notwith-

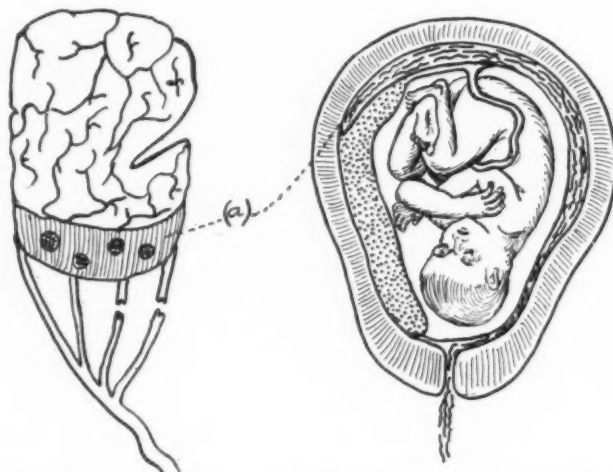


Fig. 1.—Diagrammatic representation of placenta, showing rupture of velamentous cord vessels on the left. The right half of the sketch shows the position of the placenta and the course of the blood from the separated placenta (a).

standing the fact that the fetus was probably dead and that the hemorrhage had lessened at the time of admission I felt it advisable to deliver immediately by cesarean section in view of the long rigid cervix, insufficient dilatation and the fact that the patient had already lost considerable blood with a possibility of a recurrence of the hemorrhage. The cesarean operation was done by the Davis technic. After incising the uterus the hand was introduced and the membranes swept free. The liquor amnii which was evacuated was mixed with fresh fluid blood. A part of the placenta projected into the wound and the organ itself was attached along the right side of the uterus extending down to the lower uterine segment. The child was extracted by the feet. There were no pulsations evident in the cord. The baby appeared exsanguinated and had evidently died recently. After extracting the placenta and membranes the uterine wall was sutured in layers with plain catgut. The uterus contracted well and presented at least one-half dozen fibroid nodules projecting from the surface. One of considerable size in the anterior wall was included in the incision. A tumor as large as a hen's egg which projected from the surface of the anterior wall and appeared to be breaking down

was clamped and excised from its attachment by a broad pedicle. The abdominal wall was then closed in layers and the patient returned to bed in good condition, appearing rather pale but responding satisfactorily to treatment. Further examination of the fetus showed that it was well nourished, the subcutaneous fat slight, that it was very much exsanguinated. The placenta itself was quadrilateral with the cord attached to the upper pole in the form of a velamentous insertion. A rupture had taken place through two of the separated vessels and from this site the fatal hemorrhage had evidently taken place. In addition an area of about two finger-breadths at the upper pole presented several infarcts and had evidently separated from the uterine wall. (Fig. 1.)

In commenting on this case we may state in summary that we are dealing with a primipara in the eighth month of her pregnancy who had gone through a mild degree of toxemia of the nephritic type which had responded favorably to treatment. The placenta presented infarct formation which is often associated with such toxemia and which undoubtedly led to the separation of the organ. It is probable that the uterine contractions induced by the castor oil contributed to the separation of the placenta and that this likewise resulted in the laceration of a portion of the velamentous cord. The sudden gush of blood noted by the patient probably came from the separated placenta although this blood apparently had to travel from the upper pole of the uterus to the cervix between the fetal membranes. There was insufficient dilatation of the cervix and no evidence of placental separation at the lower pole which would have produced this amount of bleeding. Strange to say, the patient did not experience the pain usually associated with premature separation of the placenta. The baby of course died from asphyxia as the result of intrauterine hemorrhage from the cord. It will be noted in this case, contrary to the usual findings, the velamentous cord was inserted at the upper pole of the placenta, whereas in the cases generally reported this anomaly was present in the region of the cervix and rupture occurred as the cervix dilated. In this respect our case differs from those ordinarily observed. The patient made an uneventful recovery, the wound healed by primary union and there was no shock. Subsequent urine examination disclosed nothing abnormal.

Knapp² described a twin labor in which both fetuses were lost from this accident, the anastomosis between the cords contributing to the result. Peiser³ reports a case in a para-iii with two previous normal labors. Her last was spontaneous and the baby was born dead and examination showed rupture of a velamentous cord. Miranoff, reporting the incidence of this complication in the material of the Dresden Frauenklinik noted a frequency of 5 per cent velamentous cords among twin pregnancies and 0.57 per cent in all labors. The occurrence has been variously estimated by several observers as occurring in from 0.4 to 0.9 per cent of all cases.

The diagnosis of the condition and the delivery of a living child is rather unusual. Ahlfeld has had two cases. Hartman⁴ reports a case

associated with a lateral placenta previa in which he did a version with the delivery of a living child.

The placental insertion of the cord is subject to considerable variations, most of which are without pathological significance. The presence of the so-called velamentous insertion of the cord must always, however, be regarded as a source of danger to the child. In this anomaly the umbilical vessels become separated at varying distances from the placenta and take a course between the amnion and chorion before reaching their placental termini. This means that when labor begins a rupture of the membranes occurs in the immediate vicinity of these isolated vessels, especially if they happen to be located over the internal os, the umbilical artery or the veins as the case may be, are torn through with the loss of the fetus from hemorrhage, or the advance of the presenting part may compress these vessels and produce fetal asphyxia. Whether these babies are less well developed or whether premature labor may occur as the result of this anomaly, the outcome is doubtful. A considerable number of cases of fetal death from this source have been recorded among them one by Williamson¹ in which the cord ruptured at the upper pole of the ovum when the patient went into the second stage and fetus died notwithstanding a rapid forceps extraction. Williamson believes that if the diagnosis is made early in labor, cesarean section is indicated but after rupture the chances of securing a living child hardly warrants this exposure of the mother.

The frequent association of velamentous cord insertion with placenta previa should lead us to bear this complication in mind. Again, irregular bleeding at the end of the first stage of labor should also lead us to suspect this condition where a lateral placenta was believed to be present and none found on careful examination, especially where the presenting part is well engaged. As for the methods of treatment, it is radical to suggest a cesarean section in order to obviate the long delay incident to complete dilatation of the cervix but where the accident occurs in a primipara with such a severe hemorrhage as in the case herewith reported, due to another cause, cesarean section would be the only method of choice.

It is claimed that velamentous insertion of the cord is always associated with placental anomalies such as previa and succenturiata and also infarcts as noted by De Lee.⁵ Multiple fetuses, twins and triplets, are also reported as accompaniments of this cord anomaly.

The diagnosis of the condition is only possible if the pulsating vessels can be felt within the circle of the dilating cervix over the bulging bag of waters. In such cases it may be possible to rupture the membranes between the vessels after dilatation is complete and then deliver the child as rapidly as possible otherwise pressure will produce asphyxia. Where the cervix is not yet fully dilated a Voorhees or other soft rubber bag may be carefully inserted so as not to produce a premature rupture

of the membranes, but fetal asphyxia is readily possible in such cases.

In primiparae, however, such as the present case, with long rigid cervix, even if a diagnosis had been made, such slow methods would have been of no avail. Where the cord is inserted at the upper pole of the uterus, as in this instance, a diagnosis by palpation is, of course, impossible.

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23 EAST NINETY-THIRD STREET.

(For discussion see p. 664.)

IS INTERFERENCE JUSTIFIABLE AFTER TWENTY-FOUR HOURS OF LABOR WHEN NO OTHER INDICATION IS PRESENT?*

A STUDY BASED UPON A SERIES OF PROLONGED LABORS
CONSERVATIVELY TREATED

BY ALFRED C. BECK, M.D., BROOKLYN, N. Y.

THE sense of security which is obtained by the use of the two flap, low incision cesarean section after a test of labor, has led us to resort more frequently to a thorough test of labor whenever relative disproportion exists. By this routine we mean one that has allowed sufficient time for complete dilatation and several hours of second stage pains, as we have learned that accurate conclusions concerning the need for suprapubic delivery can be obtained only after the patient has been permitted to completely dilate her cervix and have several hours of second stage pains with ruptured membranes. While the majority of the patients so treated have been delivered either spontaneously or by some relatively simple procedure, a number of them have been many hours in labor. The end results in these instances of prolonged labor were so satisfactory that we were led to question the value of many of the procedures which have been advised as a prophylaxis against prolonged and difficult labor. In order that we might test out this hypothesis we decided to abandon these measures and accordingly conducted a series of cases in which we paid no attention to the size of the child or the so-called danger of allowing the pregnancy to continue beyond the expected date of confinement. Occipitoposteriors were managed expectantly and no

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attempt was made to favor dilatation in dry labors. In this series we did not interfere in any way until the patient had at least two hours of good second stage pains unless a definite fetal or maternal indication arose. The use of this routine gave us a considerable number of prolonged labors. While such labors were trying to the patient and required no little courage on our part the results amply rewarded us for the many hours of worry that might have been avoided had we resorted more frequently to operative interference.

INCIDENCE OF PROLONGED LABORS

Since the beginning of this study 1753 women have been confined in the Long Island College Hospital and by our out-patient depart-

TABLE I
INCIDENCE OF LONG LABORS

Service cases	1138	Long labors	79
Private cases	615	Long labors	67
Total cases	1753	Long labors	146

TABLE II
DURATION OF LONG LABORS

24 to 30 hours	63 cases		or 43.1%
30 to 36 hours	30 cases		
36 to 42 hours	15 cases	83	or 56.9%
42 to 48 hours	7 cases		
Over 48 hours	31 cases		

TABLE III
INCIDENCE OF LONG LABORS IN VARIOUS CONDITIONS

PROLONGED LABOR OCCURRED IN	THIS WAS
62 or 27.7% of the 206 dry labors	42.4% of all long labors
108 " 19.2% " " 556 primiparae	74 % " " " "
22 " 35.4% " " 60 funnel pelves	15 % " " " "
15 " 24.9% " " 61 inlet contract.	10.2% " " " "
80 " 9.7% " " 825 occip. ant.	54.8% " " " "
47 " 21.4% " " 219 occip. post.	32.1% " " " "
9 " 13.2% " " 68 breech	6.1% " " " "
1 " 7.1% " " 14 twin	1.2% " " " "
1 " 11.1% " " 9 fibroid ut.	1.2% " " " "
13 " 10.2% " " 127 4000 gm. child	16.4% " " " "
2 " 20 % " " 5 bicornate ut.	2.5% " " " "

TABLE IV
INCIDENCE OF LONG LABORS IN VARIOUS CONDITIONS, DRY LABORS EXCLUDED

PROLONGED LABOR OCCURRED IN	
8 or 15 % of the 53 Funnel pelves	10.1% of all long labors
4 " 7 % " " 54 inlet contractions	5 % " " " "
53 " 7.7% " " 798 occip. ant.	64 % " " " "
22 " 11.3% " " 194 occip. post.	26.1% " " " "
8 " 6.5% " " 122 4000 gm. child	10.1% " " " "
2 " 20 % " " 5 bicornate ut.	2.5% " " " "

ment. Of these labors 146 lasted over 24 hours. Of this number 43.1 per cent terminated in from 24 to 30 hours and 56.9 per cent continued for more than 30 hours. The frequency of this condition in private and service cases is shown in Table I. Table II presents a more detailed account of the duration of these long labors. The various conditions that might influence the length of labor were considered individually and collectively. In this analysis the outpatient cases were omitted. Of the 556 primiparae in the hospital series 108, or 19.2 per cent, were in labor more than 24 hours. Slightly over one-fourth of the 266 dry labors were prolonged (see Tables III and IV).

ETIOLOGY

Early rupture of the membranes seems to be the most frequent of the tangible etiological factors. About one-fourth of the dry labors

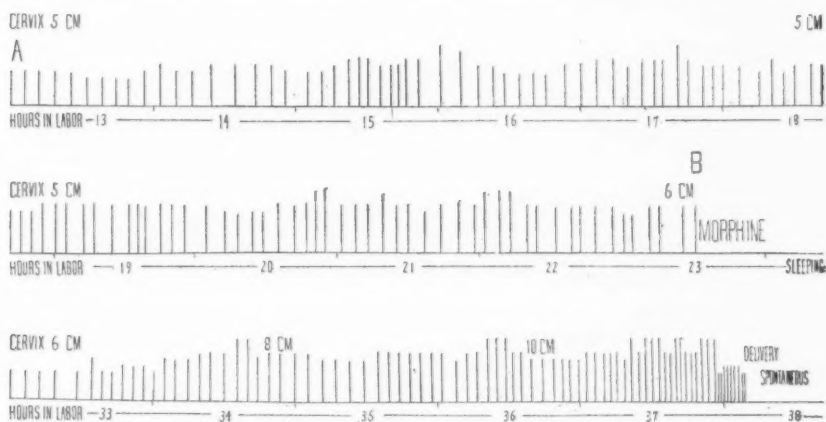


Chart I.—Graphic representation of the uterine contractions during the last 26 hours of a prolonged labor. Each perpendicular line represents a contraction. The height of the line shows the duration of the contraction. The spaces between the lines show the intervals between the contractions. From (A) to (B) the contractions were irregular in frequency and duration, i.e., those of a fatigued uterus and in the 11 hours represented by this part of the chart the cervical dilatation increased only one cm. Sufficient morphine was given at (B) to allow the patient to sleep. Following the resumption of labor the contractions progressively increased in frequency and intensity and the cervix was completely dilated in four hours and spontaneous delivery occurred.

were prolonged. It is difficult to account for the exact cause of the remainder of the long labors in this series. From a study of the individual cases we must conclude that the chief difficulty is one of faulty uterine contractions.

CONDUCT OF LABOR

In the conduct of all of our labors we aim to have the patient secure as much rest as possible. A senior student is required to remain in the delivery room throughout the entire labor. He keeps a record of the frequency, strength and duration of the uterine contractions. The mother's pulse and temperature as well as the fetal

heart rate are carefully observed. Nourishment is given not as often as the patient wishes it but as often as we can force her to take it. In the intervals between contractions she is urged to rest and, if possible, sleep. As soon as the membranes rupture, if the cervix is fully or almost fully dilated, a snug abdominal binder is adjusted and the voluntary efforts are encouraged. This routine which is followed in all of our cases is an excellent one for those that have long labors since it aims to conserve the patient's strength for the second stage. The only additional measure employed in a prolonged labor is the use of liberal doses of morphine. Whenever the character of the contractions shows that the uterus is fatigued, sufficient morphine is given to stop the labor and allow the patient to sleep. Chart I shows the duration and frequency of the contractions in a prolonged labor. Each perpendicular line represents a uterine contraction. The height of the lines shows graphically the duration of each labor pain and the space between each line represents the interval between contractions. From *A* to *B* the pains were weak and did not progressively increase in frequency. We believe that this is the picture of a fatigued uterus and our experience has taught us that very little dilatation is accomplished by such contractions. The patient received an injection of morphine at *B* and went to sleep. Complete dilatation followed soon after the resumption of labor and delivery was spontaneous. Maternal exhaustion seldom occurred when these long labors were handled in this manner and aside from the anxiety experienced by the attending obstetrician very little added difficulty was observed.

END RESULTS

As the private patients were treated by a number of different men and no definite plan was followed in the care of the prolonged labors in this group, the service cases only were considered from the standpoint of the end results. There were 79 long labors in the 1138 general service cases. All but 13 of these delivered spontaneously. Forceps were used in six either because of a marked change in the fetal heart rate or a prolonged second stage. Two breech extractions were done for the same reasons and five labors were terminated by cesarean section. The sections were employed in cases of relative disproportion that failed to engage after a thorough test of labor. Three stillbirths and three infant deaths on the first, fourth, and fifth days, respectively, gave us an infant mortality of 7.6 per cent. One mother died on the third day after a cesarean section. When we consider the fact that these 79 cases (Table V) were the difficult ones of the entire service series of 1138 cases, the end results speak well for the routine which has been followed. Additional proof of the value of conservatism is shown by the end results in the entire series. Of

TABLE V
END RESULTS IN 79 SERVICE CASES

Prolonged labors	79
Stillbirths	3
Deaths under 14 days	3
Total infant deaths	6 or 7.6%
Maternal death	1 or 1 to 79 cases
Entire series in which these prolonged labors occurred	
Service cases	1138
Stillbirths	21
Deaths under 14 days	14
Total infant deaths	35 or 3%
Maternal deaths	2 or 1 to 568 cases

the 1138 deliveries in which this group of 79 prolonged labors occurred, 21 resulted in stillbirths and 14 infants died within the first two weeks, a total infant mortality of 35 or 3 per cent. Two mothers died, a maternal mortality of 1 to 569 cases.

Should we have resorted to the use of manual dilatation or incision of the cervix and forceps delivery in these instances of prolonged labor? From the fact that in many of these cases the head was not engaged after twenty-four or even thirty hours of labor we doubt very much whether our end results would have been as good had these procedures been used.

Should we have used bags or vaginal packs in our dry labor cases? As there were 138 cases in which the membranes ruptured early this type of interference would have been required that number of times.

Should we have induced labor prematurely in our cases of pelvic contractions? We believe that all but a few of the patients that show relative disproportion will deliver spontaneously if they are permitted to have a thorough test of labor. We therefore feel that a larger number of living infants will be born and that they will have a better chance to survive if we allow these patients to go to term and have a test of labor. We admit, however, that this routine occasionally subjects the mother to the risk of a cesarean section.

Should we have induced labor because of the fear of a large child? As 74 of the infants in the series weighed over 4000 grams, 74 inductions for this indication would have been necessary.

Should more cesarean sections have been done? The large number of spontaneous deliveries that occurred after a test of labor together with our low infant and maternal mortality proved that we were not negligent in the matter of cesarean section.

We doubt very much whether our end results would have been better had we interfered more frequently. Our only conclusion therefore against the routine advocated in this paper is that it calls for considerable courage and is accompanied by considerable worry on the part of the attending obstetrician.

THE RUBIN TEST AND ITS THERAPEUTIC APPLICATION*

BY JOHN C. HIRST, M.D., AND CHAS. MAZER, M.D., PHILADELPHIA, PA.

IN ORDER to formulate intelligently the prognosis and therapy of female sterility, a definite knowledge of the patency of the fallopian tubes is essential. The value of transuterine gas inflation as a means to determine this condition has been amply demonstrated by its originator, Dr. I. C. Rubin, and others. The treatment of female sterility was thus placed on a comprehensive and scientific basis.

Assuming for the sake of argument that the mortality of dilatation and curettage and that of the various plastic operations on the cervix is *nil*, the morbidity that frequently follows these operations, especially with the use of the metranokter and other forms of stem pessary, is well known.

We must also consider the expense and physical discomfort incident to an operation which is done blindly on the assumption that the tubes are not responsible for the existing sterility. These operations are naturally doomed to failure in the presence of obstruction in the tubes.

FREQUENCY OF OCCLUDED TUBES

In our series of 70 cases of sterility, 64 have never been pregnant, the period of sterility ranging from three to twelve years. In these 64 cases of absolute sterility, 28 were found to have nonpatent tubes. In the six cases of relative sterility, two were found nonpatent.

When it is remembered that the class of patients we treat at the Mt. Sinai Hospital of Philadelphia, submit more readily to the various operations for the relief of sterility than others, one will not wonder that only 10 out of 70 had escaped the surgeon's care during their course of sterility. Some have been curetted three times, a few had plastic operations on the cervix, and several had abdominal operations, apparently for retroversion. None escaped the annoyance and expense of frequent office treatments, supplemented by vaginal douches for long periods.

Parenthetically let us add that women who were previously subjected to some operation for the relief of sterility show a greater percentage of nonpatency than those who have not been operated on. The 10 cases that were not previously operated on, showed nonpatency in only 30 per cent. These figures, while not conclusive, may, if corroborated by other investigators, indicate the danger of dilatation and

*Read at a meeting of the Obstetrical Society of Philadelphia, May 4, 1922.

curettage very frequently practiced in cases of doubtful sterility. Many in this series were curetted during the first year of married life, and may have become sterile because of the operation.

The contention of some gynecologists that 70 per cent of primary sterility in the female, yield to dilatation and curettage, supplemented by various nonoperative measures, seems to be grossly overestimated. As shown by our figures 42.5 per cent of primary sterility cases have occlusion of the fallopian tubes,—a condition that precludes the possibility of pregnancy without recourse to an abdominal operation. We believe that no physician should undertake the treatment of sterility in the female without excluding definitely the existence of occlusion of the fallopian tubes. Unless the presence of an active process in the genital tract prohibits manipulation of this sort, the interests of the patient and physician are best served by a definite understanding of the underlying cause of the sterility.

Here is a striking example: One of our patients, aged twenty-nine, married twelve years, consulted one of our foremost gynecologists concerning her sterility, after we had done the Rubin test on her twice and found her tubes nonpatent. He, not knowing our findings, advised a dilatation and an Alexander operation to correct a symptomless retroversion. To make matters worse, he gave her a very hopeful prognosis. When informed by the patient of our findings, he suggested plastic surgery on the tubes and receded considerably in his prognosis.

SAFETY OF THE PROCEDURE

We followed up our cases very carefully. In no case was there evidence suggestive of peritoneal irritation. We repeatedly examined our patients and found no pelvic pathology where it did not preexist. When we limited ourselves to the use of oxygen, some cases experienced pressure about the diaphragm and pain in the right shoulder for many hours. The substitution of carbon dioxide eliminated these symptoms, as this gas is very rapidly absorbed. So rapid is the absorption of the carbon dioxide that an interval of only ten minutes between the introduction of the gas and the fluoroscopic examination may give the inexperienced operator a false impression of the result of his examination.

With a moderate experience in the technic, the fluoroscopic examination is unnecessary and the test can be carried out with safety as a routine office examination. The symptoms are so mild and of so short duration, that the patient may go about her daily routine immediately following the examination.

The fear of air embolism is unfounded. In no instance were there symptoms pointing to this condition. As stated by Dr. Rubin,¹ army

surgeons have often used intravenous oxygen injections for therapeutic purposes, especially in pneumonia.

The combined experience of gynecologists in scattered parts of the country is more valuable than theoretical objections to gas inflation on the ground that the method is dangerous.

TECHNIC

We shall not go into a description of the apparatus. A careful pelvic examination should precede the test. An acute or subacute cervical or tubal infection should deter the observer from proceeding.

The exact position of the uterus must be ascertained prior to the introduction of the cannula, which must be directed in the course of the uterine canal. Failure to observe this may result in perforation of the uterus.

The vagina is carefully cleansed, the speculum introduced, and the cervix dried and painted with tincture of iodine. The cervix is steadied with a tenaculum applied to its anterior lip. The cannula is introduced in the direction of the uterine canal, a rubber tip on the cannula occluding the external os. The gas is then permitted to enter the uterine cavity. In patent cases the pressure, as indicated by the mercury manometer will immediately rise to about 100 mm. and sharply fall to 40 or 50, at which point it fluctuates until the cannula is withdrawn. When the pressure reaches 150 or more, it is likely that the tube lumen is partially or completely closed. A repeated finding of 200 mm. without any tendency to recession is pathognomonic of nonpatency of the tubes.

When the pressure reaches a high level and then falls sharply to a low level, say to 50 mm., it indicates, in our opinion, that some obstruction was dislodged. We have repeated the test in several of these cases and found that the pressure never reached the high level attained during the initial test. We, therefore, concluded that, whatever the obstruction may have been, it was eliminated as a factor. When the pressure reaches a high level and falls but slightly, fluctuating at 160 mm. or more, a partial stenosis of one tube with occlusion of the other may be assumed. We admit that, thus far, we have insufficient proof to support these deductions, though logically they are sound.

We operated on a woman two days after the Rubin test which gave us the above-mentioned findings. She entered the wards with an acute gonorrheal salpingitis. After twelve weeks of conservative treatment, we decided to correct the adherent retroversion by an abdominal section in the hope of relieving her of the pain in the back and lower abdomen. As traces of the acute infection of the cervix and tubes were no longer in evidence, we ventured to subject her

to the Rubin test preliminary to the abdominal section. The pressure rose to 175 mm., gradually fell to 140 mm., fluctuating at this level until 320 c.c. of oxygen were introduced. The procedure gave her considerable pain in the left tuboovarian region. The fluoroscope established the presence of a pneumoperitoneum. On section two days later, we found both tubes apparently normal, the uterus retroverted and fixed. The right tube was probed and found stenosed at the isthmus. We wished to avoid traumatizing the left tube and abstained from probing it. We believe that the pain she experienced during the inflation was caused by the gas passing through a very narrow constriction in the left tube. We did the Grad operation for retroversion without attempting to restore the lumen of the tubes, not wishing to prolong the operation unnecessarily.

For the purpose of producing a pneumoperitoneum preliminary to x-ray, the transuterine method is safer and attended with less discomfort than the transabdominal route. It is obviously limited to non-pregnant married women, free from acute inflammatory conditions of the pelvis. To the gynecologist it offers a valuable aid in the diagnosis of pelvic conditions. Thus far we have done too little work in this direction to deserve mention, but Dr. Reuben Peterson² of Ann Arbor, Michigan, has demonstrated its value beyond a shadow of doubt. He draws the following conclusions:

1. Pelvic organs can be clearly demonstrated by the pneumoperitoneal x-ray plate.
2. Owing to the distention with gas, the tubes are rather more clearly demonstrated where the inflation has taken place through the uterus than transabdominally.
3. With improved position (knee-chest and Trendelenburg) the pelvis will be shown clear of bowel coils. Retention of such coils in the pelvis will be proof that intestinal adhesions are present.

As reported by Dr. B. C. Hirst³ two fatalities recently occurred in Philadelphia as a result of the transabdominal method of pneumoperitoneum. No such accident can thus far be attributed to the transuterine method of abdominal inflation for x-ray purposes.

THERAPEUTIC INDICATIONS OF INTRAUTERINE GAS INFLATION

Following a plastic operation on the tubes for the relief of sterility, intrauterine gas inflation will not only reveal to us the success or failure of our endeavor, but also aid in keeping the tubes permeable. Dr. I. C. Rubin⁴ produced a transuterine pneumoperitoneum as early as ten days following a transplantation of the tubes. It seems to us sound judgment to inflate the tubes repeatedly in these cases until the danger of a recurrence of the stenosis is well passed.

One negative result is not enough to establish nonpatency. Occa-

sionally a uterine cornual polyp may occlude the tubal ostium as a ball valve and a greater pressure may succeed in forcing the gas through. In such an event a careful exploration of the uterine horns, by means of the curette and placental forceps is, in our opinion, therapeutically indicated.

Very few primary sterility cases give a history of acute pelvic infection. The nonpatent cases may have had a catarrhal salpingitis which, generally, goes unrecognized to resolution. This condition is characterized in its primary state by hyperemia and thickening of the mucous membrane, increased secretion from the mucosa, and some destruction of the cilia.

The acute condition in these cases may subside leaving sufficient inspissated mucus in the tubal lumen to occlude it. We find a similar condition in the eustachian tube, which is structurally not unlike the fallopian tube. A retracted drumhead indicates to the otologist insufficient ventilation of the middle ear because of occlusion of the eustachian tube. To relieve this condition, the otologist resorts to inflation of the nasopharynx under pressure by means of the Politzer bag. He is not unmindful of the possibility of sweeping some infectious material into the middle ear, and selects his cases carefully. He is frequently forced to make several attempts with increased pressure before he succeeds in opening the eustachian tube.

This is probably the condition we find in some cases of fallopian tube occlusion. We inflate the uterus under pressure, the inspissated mucus in the tube or the agglutinated plicae of the endosalpinx offer resistance to the passage of the gas into the peritoneal cavity, as indicated by the mercury manometer. We use greater pressure and the mercury suddenly falls, fluctuating at a low level, until the cannula is withdrawn. Something must have been dislodged to permit the passage of the gas. The peritoneal cavity is a great deal more competent to cope with infectious material swept into it than the middle ear. It is doubtful whether this material is infectious at all.

We have on record three women who became pregnant so soon after the Rubin test, that we are disinclined to view this phenomenon as incidental.

CASE 1.—Mrs. R., (File No. 21-11587) aged thirty, married eight years, had a dilatation and curettage for the relief of sterility four years ago. Menstruation normal, pelvic examination negative. We did the Rubin test on Dec. 12, 1921. Pressure as indicated by the manometer was 150, with a gradual decline to 50 mm. Patency of the tubes proved by the fluoroscope. Pelvic examination on Feb. 23, 1922, showed an enlarged soft uterus. Subsequent examinations established pregnancy beyond doubt.

CASE 2.—Mrs. B. S., aged twenty-six, married seven years, never pregnant. Menstruation normal. Had a dilatation and curettage a year following her marriage. Pelvis showed no evidence of abnormality. The Rubin test on Oct. 4, 1921,

proved the tubes patent. Her first missed period was on Jan. 4, 1922. When seen again recently, the presence of pregnancy was quite evident. This was one of our very early cases when the pressure at which the gas entered the tubes was not recorded.

CASE 3.—Mrs. G., aged twenty-nine, married three years. Menstruation normal. Had a dilatation and curettage eighteen months ago. Pelvic examination showed a retroverted slightly adherent uterus. Tubes and ovaries not palpable. Rubin test on Dec. 22, 1921, indicated nonpatency. Before her physician could arrange for a repetition of the test, the woman had missed her period and when seen later, the presence of pregnancy was quite evident.

CONCLUSIONS

1. Before proceeding with the treatment of a case of sterility, it is imperative to determine the patency of the tubes, assuming that the male element is not a factor in the sterility.
2. Nonpatency is more frequent than previous records indicate.
3. The Rubin test is a safe procedure in the hands of the average gynecologist.
4. The transuterine route of pneumoperitoneum for x-ray purposes is better for gynecologic diagnosis than the transabdominal route.
5. The therapeutic possibilities of intrauterine gas inflation deserve attention on the part of the gynecologist.

REFERENCES

- (1) Jour. Am. Med. Assn., Sept. 4, 1920. (2) Surg. Gyn. and Obst., Aug., 1921.
(3) AM. JOUR. OBST. AND GYNEC., Aug., 1922, iv, 160. (4) AM. JOUR. OBST. AND GYNEC., August, 1922, iv, 192.

1823 PINE STREET.
1626 SPRUCE STREET.

(For discussion, see p. 670.)

AN IMPROVED METHOD OF SUPPORTING THE BLADDER
AND VAGINA AFTER VAGINAL HYSTERECTOMY
FOR PROCIDENTIA*

BY ALFRED HEINEBERG, P.D., M.D., PHILADELPHIA, PA.

PROLAPSE of the vagina and loss of support to the base of the bladder are two of the sequelae difficult to prevent in performing vaginal hysterectomy for procidentia. Success depends upon the following conditions: 1. A shelf of broad ligament upon which the bladder may rest. 2. Sufficient traction, in the right direction, upon the upper part of the vaginal walls. 3. Fascial support to the base of the bladder by reconstruction of the triangular and utero-vesical ligaments, when possible. 4. Narrowing of the anterior vaginal wall by elliptical or triangular resection. 5. Reconstruction of the pelvic floor and decreasing the size of the vaginal outlet by interposition of the edges of the levator ani, transversus perinei and bulbo-cavernosus muscles between the vagina and rectum. 6. Narrowing of the posterior vaginal wall by broad and long triangular resection.

This paper deals with only the first two of these conditions, and presents a technic for disposing of the stumps of the broad ligaments which has given uniformly satisfactory results during the last five years.

While the Mayo method of suturing the cut edges of the broad ligaments to each other in the median line forms an excellent shelf for the bladder, it often fails to prevent prolapse of the vagina because the traction upon the vaginal walls, produced by attaching them to the lower edge of the newly formed shelf, is not sufficient to hold them in place.

The other method in common use, viz: the attachment of the upper stump of each broad ligament to the cut edge of the lateral vaginal wall on its respective side, fails to form a shelf for the bladder. Furthermore, the traction supplied, even though sufficient to hold up the vaginal walls, is of such direction as to stretch the vaginal vault and decrease support to the base of the bladder.

The method which is here described overcomes the chief causes of failure in the two preceding operations. The uterus is removed in the usual manner. The broad ligaments are ligated in section close to the uterus. *The uppermost ligature should include the uterine end of the tube and round ligament.*

If the tubes and ovaries are removed, the infundibulo-pelvic liga-

*Read at a meeting of the Obstetrical Society of Philadelphia, May 4, 1922.

ment should be drawn over and its inner end be included in the ligature applied to the uterine end of the round ligament.

The upper stumps of the broad ligament thus formed are brought across the median line of the pelvis so that the stump of the left ligament may be sutured to the cut edge of the right vaginal wall

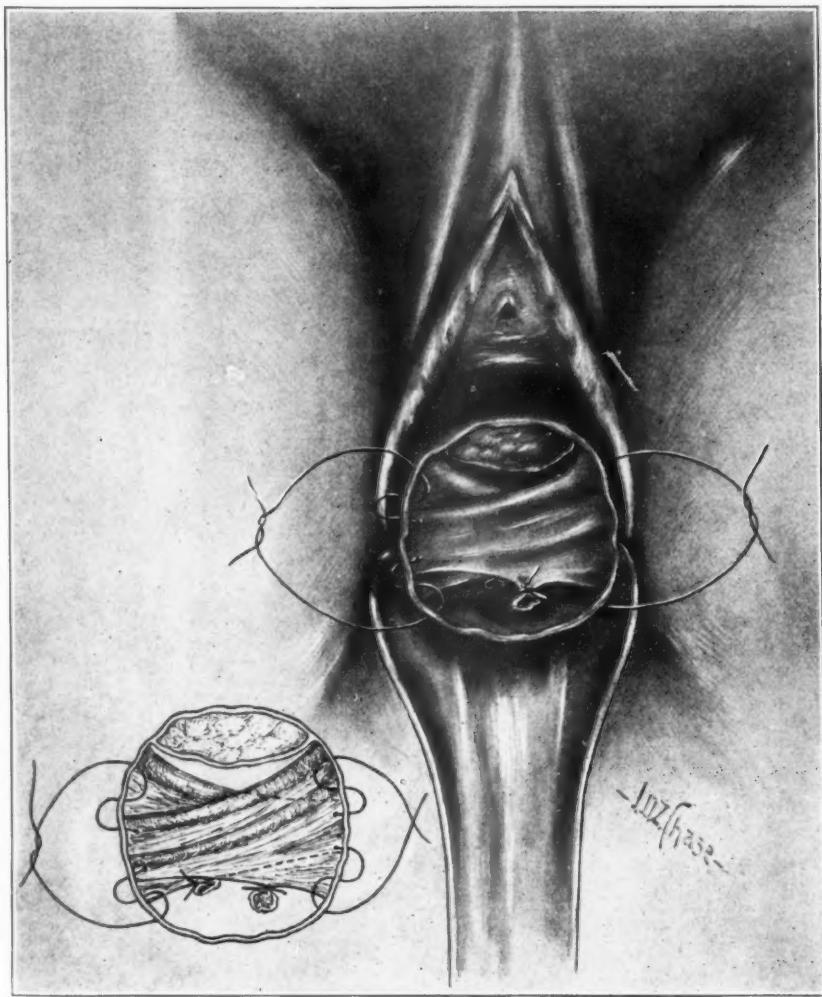


Fig. 1.

and, *vice versa*, that of the right ligament to the left vaginal wall. The stumps are not brought into the vagina but are inserted into a pocket, external to the upper end of each lateral vaginal wall.

The degree of traction to be made upon the vaginal walls should be carefully gauged. It can be adjusted by drawing down the ligament, determining its length and tension and selecting a point in it to which it is desired to suture the vaginal wall. The suture I

employ is a purse-string, which includes (along with the broad ligament stump) about one-fourth of the circumference of the opening in the vaginal wall on each side (see Fig. 1). The effect of such a suture is to support and contract the vaginal vault. The suture on each side should be applied before either is tied. While traction is made upon both ends of each suture, drawing the ligaments into the position they are to occupy, the edge of the posterior vaginal wall is sutured to the posterior surface of the interposed ligaments. Subsequent to resection, the upper edge of the anterior vaginal wall is sutured to the anterior surface of the ligaments.

The advantages of crossing the broad ligaments and attaching each to the vaginal wall of the opposite side are:

- (a) To form a shelf for the bladder.
- (b) To close the opening in the vagina by means of the oblique traction upon its walls.
- (c) To prevent dilatation of the vaginal vault and consequent lessening of the support to the base of the bladder.

1923 SPRUCE STREET.

(For discussion, see p. 671.)

POSTABORTAL HEMOLYTIC STREPTOCOCCEMIA*

By PHILIP F. WILLIAMS, M.D., PHILADELPHIA, PA.

From the Gynecological Service of the Presbyterian Hospital

THE normal ratio of abortions to births at term is generally considered as about one to four or five. There can be no doubt that the actual number of abortions is higher than this ratio would show, and of the etiological factors responsible, at least as seen in hospital practice, induction of abortion by illegal instrumentation is not the least frequent cause. The statistics of Meyer,[†] from the Carnegie Institute of Embryology, would seem to indicate that about 10 per cent of all abortions were admittedly mechanical in origin.

Whether or not the economic conditions prevailing in recent years, which make the bearing and raising of a large family such a costly experiment, whether fear of the pains of labor, the shame of illegitimacy, or an unnatural feeling toward the discomforts and annoyances of motherhood, or the gradually developing widespread discussion of birth control and a feeling of necessity to practice it are responsible factors, can only be determined in each individual case by a full knowledge of the facts concerned. Many women coming under observation openly express themselves of the desire of getting rid of an early pregnancy, and failing, as so often happens in medica-

*Read at a meeting of the Philadelphia Obstetrical Society, May 4, 1922.

[†]Meyer, A. W.: The Frequency and Cause of Abortion. *AMER. JOUR. OBST. AND GYNEC.*, 1921, ii, 138.

tive measures, are prone to practice interruption of the pregnancy by directly and instrumentally interfering with the ovum in situ, or to have this done for them.

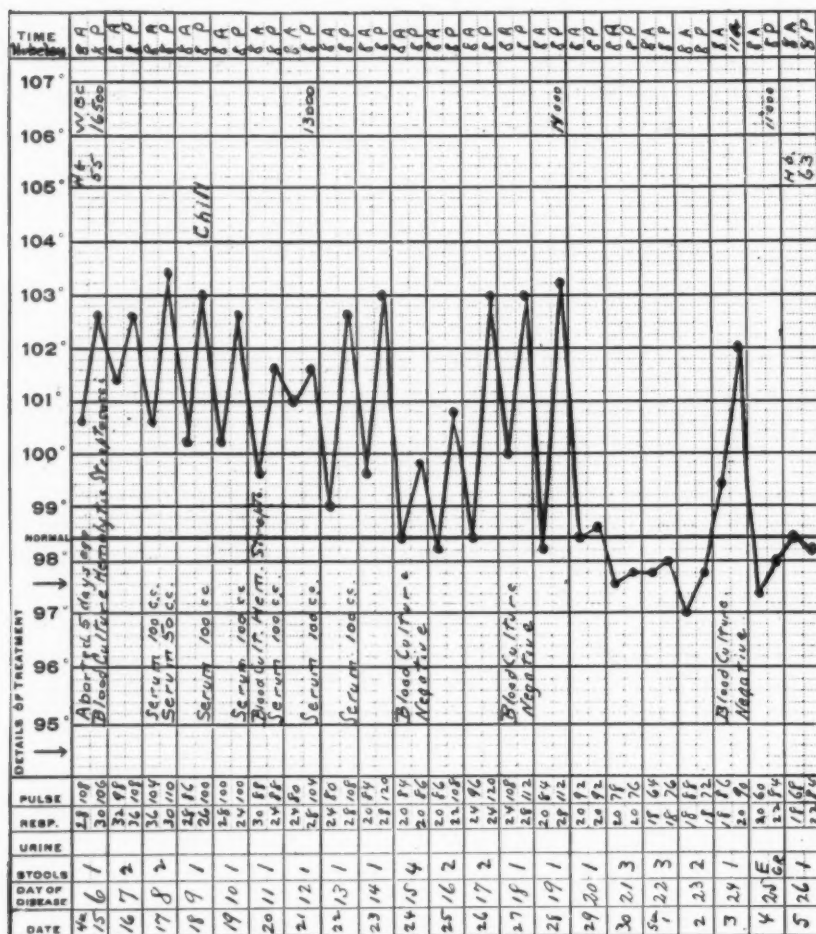
The grave, and often fatal, consequences of such practices are seen in all gynecological services in the large number of septic conditions, local and general, which follow upon unclean instrumental induction of abortion. Indeed, criminally induced abortions are subject to febrile complications in a large majority of the cases. The occurrence of four cases of abortion, complicated by hemolytic streptococemia, with recovery under the use of antistreptococcic serum, on the gynecological service of the Presbyterian Hospital during the past year seemed of sufficient interest to warrant reporting them, together with some pertinent comments.

The subject of hemolytic streptococcic infections has undoubtedly been subject to more widespread interest since the extensive bacteriological studies of the infections caused by this organism in the cantonments during the war. These investigations have shown that this streptococcus is of unusual virulence when awakened to its full pathogenicity, and that it is found dormant in many hidden or cryptic foci of infection, as the tonsils, nasal sinuses, and diseased teeth. A brief review of the literature on the bacteriology of the genital tract in women shows that this organism is not infrequently present in the vaginal and cervical secretions. Naturally, unclean surgical procedures opening up relatively large areas of wound surface, through the production of abortion, lend ample opportunity for the proliferation and full development of the pathogenicity of the organism, with easy invasion of the blood stream. In order to determine the relative incidence of carriers of the hemolytic streptococcus a series of cultures from the cervical canal of one hundred women, in the child bearing period, were taken at the gynecological dispensary of the Presbyterian Hospital. Seven women showed positive cultures for hemolytic streptococci, and eleven women showed positive cultures of non-hemolytic streptococci in the cervical secretions. Permar* reviewed this subject in 1917, adding his observations on 130 women, and according to his findings and those of other observers, whose work he summarized, an even larger percentage of hemolytic and other types of streptococci were found in the cervico-vaginal tract than in the present series. The dangers of intrauterine procedures through such potentially dangerous regions without antiseptic precautions are quickly apparent. The treatment of abortions, for such complications as hemorrhage, when the organisms have been carried into the uterus, are as gravely fraught with peril through the possible further opening up of avenues of invasion to the blood stream.

*Permar, H. H.: An Analysis of the Vaginal Flora in Late Pregnancy, *Am. Jour. Obst.*, 1917, lxxv, 652.

The abridged clinical histories and temperature charts of the four patients show plainly the manner of onset and course of the disease and its control by the use of antistreptococci serum.

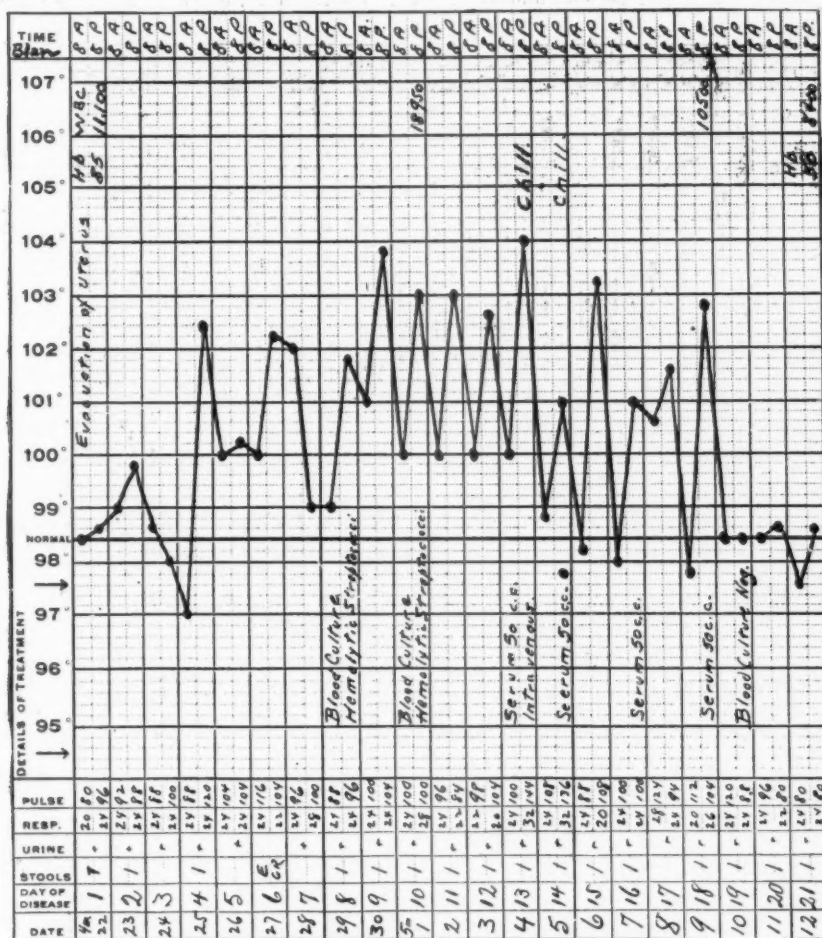
CASE 1.—C. H., a white married woman, aged 28 years, was admitted on April 14, 1921, for cough and fever following an abortion. The patient had had one pregnancy with a living child. Menses regular, last period December 19, 1920. On April 9, 1921, five days before admission, patient aborted following selfinduction



Case 1.—Temperature chart.

with an instrument, the nature of which was not stated. While in labor she had chills and fever and attacks of vomiting. An attending physician stated that the abortion had been complete. Examination showed a recently parturient multiparous genital tract, with reddish purulent lochia having a foul odor. The external os was open, the uterus enlarged, anteverted and not tender. There was slight tenderness in both lateral vaginal fornices. Physical examination of the chest revealed a suspicious area of dullness in the right lower lobe. Cervical and blood cultures showed pure cultures of hemolytic streptococci. April 17, two days after admission,

150 c.c. of polyvalent antistreptococcal serum was injected intravenously. This was followed by a rise in temperature. A total of 500 c.c. of serum was injected during the next five days. After 200 c.c. had been given an intense serum reaction occurred. After this, desensitization was practiced before injections of serum. Although the blood cultures became sterile on April 24 the temperature continued high and of a septic type until April 28. On May 3 there was an unaccountable rise in temperature, which, however, quickly subsided, and the temperature con-

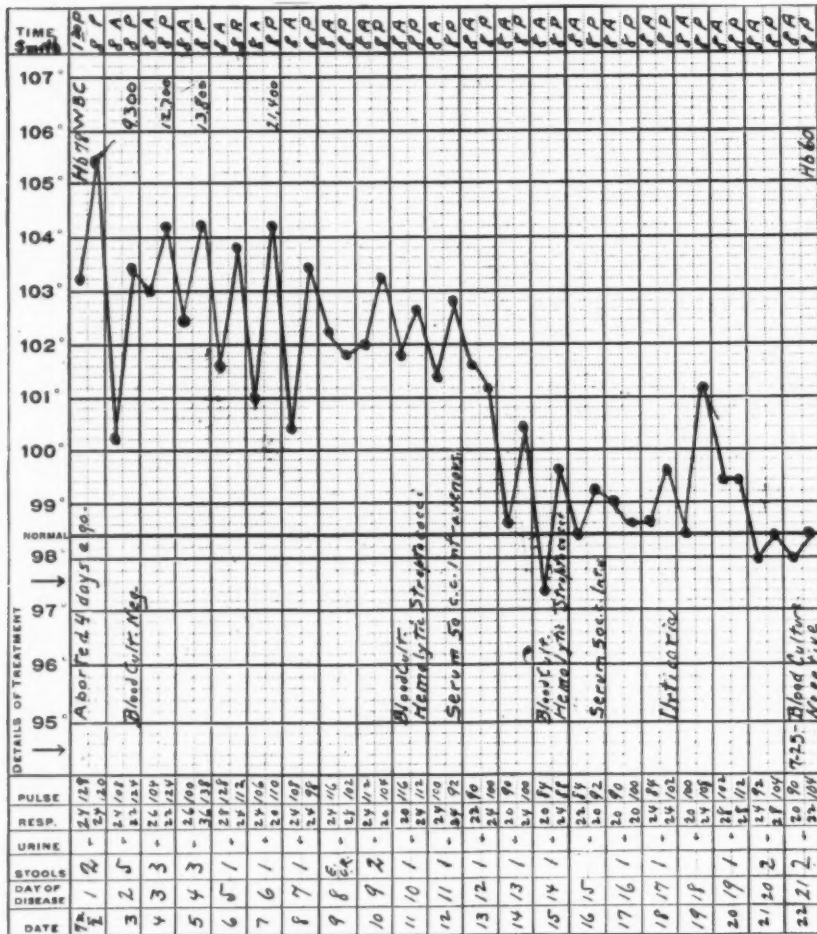


Case 2.—Temperature chart.

tinued normal until discharge. On May 10 the patient had an intense urticaria of short duration, possibly a delayed serum reaction. The number of colonies per Petri blood agar plate dropped from 97 on admission to 4 on April 20 after a total of 350 c.c. of serum had been given. Blood count on admission, erythrocytes, 2,760,000; leucocytes, 16,000; hemoglobin 55 per cent. On discharge, erythrocytes, 3,400,000; leucocytes, 10,000; hemoglobin, 68 per cent. The differential counts showed a good resistance as the polymorphonuclear neutrophils ranged from 75 to 83 per cent. Wassermann reaction was negative. No further evidence of the suspicious pneumonic area in the right lower lobe was elicited on repeated examinations

of the chest, but the respiratory rate continued higher than normal for four or five days. The coincident finding of pure cultures of the hemolytic streptococcus in the cervical canal as well as in the blood stream strongly points to the selfinduced abortion as the etiological factor in the bacteremia.

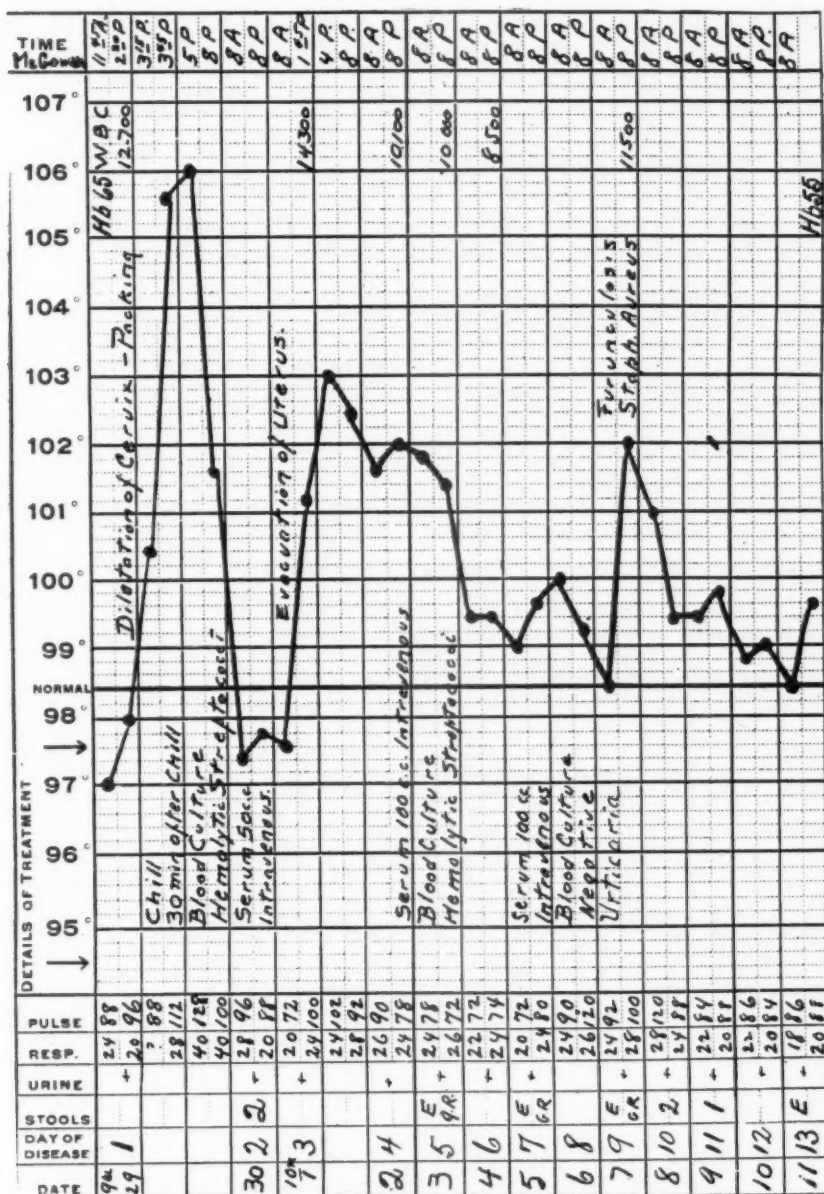
CASE 2.—B. B., a white woman, widow, aged twenty-three years, was admitted April 18, 1921, for bleeding from the vagina. The patient had been pregnant four times, three deliveries at term, with one living child, and one selfinduced abortion. Menses regular, last period January 5, 1921. On April 10, eight days before admis-



Case 3.—Temperature chart.

sion, the patient after washing a catheter with soap and water, passed it into the vagina. A scant yellowish bloody discharge with a slightly foul odor followed, and continued until April 17, the day before admission, when patient stated that she passed "a piece of white flesh about the size of an egg." Since then the bleeding had almost ceased. Examination showed a multiparous genital tract with the cervix closed. The uterus was globular and enlarged to the size of a three months' pregnancy. The patient was kept under observation, but the bleeding and foul discharge recurred and on April 22 the uterus was evacuated of a headless fetus

and the membranes. On April 25 the temperature rose to 102.2°, and the patient complained of some epigastric distress. The temperature continued irregularly elevated, and on April 29 a blood culture was reported positive for hemolytic streptococcus. Repeated culture on May 1 confirmed this finding. On May 4 the patient



Case 4.—Temperature chart.

submitted after much persuasion to the intravenous injection of fifty c.c. of anti-streptococcic serum. This dose was repeated on May 5, 7, and 9, and the temperature was normal on May 10, when a blood culture was reported as sterile, no

growth. Temperature continued normal until discharge May 22. Blood count on admission, erythrocytes, 4,450,000; leucocytes, 11,100; hemoglobin, 85 per cent. On discharge, erythrocytes 2,380,000; leucocytes, 8,400; hemoglobin, 50 per cent. A differential count made May 1, during the acme of the infection showed 82 per cent of polymorphonuclear neutrophils. Wassermann reaction was negative. Patient was given a total of 200 c.c. of serum. Chills followed two of the injections. The mental attitude of the patient, who expressed a desire to die, was responsible for the delay in earlier serum treatment.

CASE 3.—E. S., a white married woman, aged twenty-eight years, was admitted July 2, 1921, for fever and a severe burning headache following an abortion. Patient had been pregnant five times, three children living and two abortions, one in 1919 and one in 1920. She had been curetted at home following the abortion in 1919. Menses had been irregular and frequent, for the last year had been bleeding profusely, often twice a month. Last period, latter part of May, 1921. On June 28, four days before admission, patient began to bleed from vagina after lifting a heavy wash tub filled with water. An attending physician made a vaginal examination and stated "that something was hanging from womb", and for patient to save any material passed for his further examination. Patient stated that on the following day she passed an afterbirth, and developed simultaneously fever and chills, and an inguinal adenitis. Examination showed a multiparous genital tract, with sticky reddish yellow leucorrhea in the vagina and cervical canal. The internal os was closed, the uterus enlarged, anteverted and movable, not tender. Tenderness in both sides of the pelvis on bimanual examination. A right inguinal adenitis was present. Temperature on admission 103°, pulse rate 128, respiratory rate 24. A blood culture taken on admission was reported as sterile, no growth. Temperature continued elevated and of a septic type. The case was considered as a complete abortion with pelvic peritonitis, and the patient was placed in the Fowler position, with enteroclysis of glucose and bicarbonate solution, and given digalen and a liquid diet. A catheterized specimen of the urine showed a growth of colon bacillus on culture, but no pus in the urine and no kidney or bladder symptoms. Widal and other agglutination tests negative. On May 11 a second blood culture was taken and reported positive for hemolytic streptococcus. May 12, 50 c.c. of a polyvalent antistreptococcal serum injected intravenously. Temperature fell rapidly to normal. May 15, blood culture still positive and second similar injection of serum given. Temperature fell to normal and continued so, with but one flare-up, until discharge. Blood culture July 25 was reported as sterile, no growth. Patient was given a total of 100 c.c. of serum. On July 18 she developed an urticarial rash of short duration which was interpreted as a delayed serum reaction. Wassermann reaction negative. Blood count on admission, erythrocytes, 3,460,000; leucocytes, 13,800; hemoglobin, 78 per cent. On discharge, erythrocytes, 3,220,000; leucocytes, 7,800; hemoglobin, 60 per cent. Polymorphonuclear neutrophils did not drop below 74 per cent. The intense headache of which the patient complained, and which she stated felt "like a ball of fire" persisted until July 9, suggesting meningeal irritation, but disappeared overnight like magic. After the first negative blood culture, other infections were ruled out, but the error in earlier diagnosis of the true condition lay in the too quick acceptance of one negative blood culture as proof that no blood stream infection was present.

CASE 4.—J. M., a white woman, aged thirty years, separated from her husband, was admitted on September 29, 1921, for vaginal bleeding. A very incomplete history was obtained. Patient admitted that an instrument had been passed into the uterus for the purpose of bringing on an abortion, on each of four successive days before admission. On admission the temperature was 97°, pulse rate 84, and respir-

atory rate 24. The cervix was dilated and packed with iodoform gauze. Within a few hours after this minor operation the patient had a severe chill, the temperature rising after the chill to 106°, the pulse rate to 128, and the respiratory rate to 40. Blood culture taken was reported positive for hemolytic streptococcus, and fifty c.c. of a polyvalent anti-streptococcal serum injected intravenously. Temperature dropped to 97.2°, pulse rate to 96, and the respiratory rate to 28. On October 1, under gas anesthesia, the uterus was evacuated of an early ovum. Temperature rose to 103°, and continued elevated. On October 2 an injection of 100 c.c. of serum was given. Blood culture taken on October 6 was reported as sterile, no growth. Patient had an urticarial rash on October 6, and complained of stiffness of body. This was considered as a reaction to the serum. On the same date the patient developed an axillary furunculosis, with the staphylococcus aureus in pure culture as the offending organism. An autogenous vaccine was prepared and used subsequently with good results. The temperature dropped to normal on October 9, and continued for six days. Then a mild pyrexia occurred during four days, which was attributed to a cystitis, pus being found in the urine, although no bacterial contamination was present. Thereafter the temperature continued normal until discharge, October 25. Convalescence was marked by hallucinations and by a sciatica neuritis which persisted for some weeks. Blood count on admission, erythrocytes, 3,680,000; leucocytes, 12,700; hemoglobin, 65 per cent. On discharge, erythrocytes, 3,120,000; leucocytes, 13,600; hemoglobin, 55 per cent. A single differential count made during the infection showed 89 per cent of polymorphonuclear neutrophils. Wassermann reaction was negative. The patient received a total of 250 c.c. of serum. The reaction to the serum was an urticaria developing after the third injection. The furunculosis was evidently an extraneous infection. The mental change, the sciatica neuritis and the cystitis all developed after the blood cultures had become sterile and can scarcely be placed as due to the blood stream infection. It is interesting to note, however, that two of the patients had meningeal or cerebral irritation as an added feature of their disease.

DISCUSSION

In three of the four cases the abortion was produced criminally, in two by the patient herself. In the second case the cause of the abortion may possibly be laid to the strain of lifting such a heavy weight as described. Two of the pregnancies were illegitimate, a frequent finding in the histories of cases of criminally induced abortions. In the first, and probably in the third case, the bacteremia was present upon admission, although the blood culture taken on admission of the third case was reported as sterile. In the third case the head of the fetus had been expelled prior to admission. Here the infection was not manifested until the third day after operation. It may be stated here that the term evacuation of the uterus, as used in these histories, includes only digital exploration of the uterine cavity, the use of blunt placental forceps and a gauze swab to brush decidual remnants from the uterine walls, no curettes being used. In the fourth case following simple dilatation of the cervix and the introduction of an iodoform gauze tampon to promote spontaneous expulsion of the uterine contents, the case being considered as one of incomplete abortion, invasion of the blood stream occurred within a

few hours. Although the cervical culture in one case showed a pure culture of hemolytic streptococcus, identical with the results of the study of the blood, reliance cannot be placed, as a rule, on cervical or vaginal cultures on account of the abundant and mixed bacterial flora of the uterovaginal canal in the nonpregnant state, and consequently as great also in the puerperal or postabortal states. The number of injections and the amount of serum necessary to control such blood infections varies, and one can be guided only by the temperature chart, the condition of the patient, and by the results of repeated blood cultures. If a fixed technic is used in the laboratory, the number of colonies on blood plates may serve as an index to the control of the infection. Reactions to the serum were the rule, and varied from mild to severe chills and urticarial rashes. Desensitization had to be practiced in one case of severe reaction, the first. The urticarial rashes were quickly alleviated by dilute phenol lotions. The effect of the organism, which shows as its chief cultural characteristic the destruction of erythrocytes, did not produce as severe a destruction of the erythrocytes and hemoglobin in the circulating blood as might have been expected. All had a certain degree of secondary anemia upon discharge from the hospital, but not more than might have been the result of an equally severe infection of the same duration from other organisms in the postabortal state. What specific influence the serum had in controlling the anemia by reducing the blood destroying properties of the invading organism is open to speculation.

SUMMARY

Four cases of postabortal bacteremia, hemolytic streptococcic, with recovery under the use of polyvalent antistreptococcic serum are recorded. Illegal instrumentation to produce abortion is considered as the chief etiologic factor in the production of three of these infections. The dangers of nonaseptic procedures are made well evident when one considers that in a series of 100 women, seven harbored the hemolytic streptococcus in the cervical canal, and eleven others showed nonhemolytic types. A prompt diagnosis of the exact nature of such febrile conditions is best made by early, and if necessary, repeated blood cultures. Cervical cultures, if positive, and showing the same organism as that recovered from the blood stream, are of value in supporting the theory of the causation of these infections. Serum should be given early and in repeated doses, ranging from 50 to 100 c.c., depending upon clinical and laboratory findings. Reactions are the rule and vary from mild to severe chills and skin rashes. Desensitization may be necessary in cases of severe reactions. The action of the hemolytic streptococcus on the circulating blood has

not been as severe as might have been supposed. The cases reported here showed but little pelvic pathology, the most noteworthy finding being a slight degree of peritonitis and parametritis.

My indebtedness to Dr. John H. Girvin, Chief of the Gynecological Service, for permission to use the material upon which this report is based, is hereby acknowledged with thanks.

262 SOUTH TWENTY-FIRST STREET.

(For discussion, see p. 672.)

IS THE USUAL METHOD OF PREPARING PATIENTS FOR DELIVERY BENEFICIAL OR NECESSARY?

BY R. A. JOHNSTON AND R. S. SIDALL, BALTIMORE, MD.

THOSE who are familiar with the history of puerperal infection realize that to Semmelweiss belongs the credit of having first indicated the cause of the disease and the mode of its prevention. Oliver Wendell Holmes in his famous article proved that the propagation of puerperal infection took place by contagion or inoculation. In spite of this pioneer work and the recent advances in asepsis, we are confronted each year in this country with approximately 10,000 maternal deaths from this disease alone. Although the medical profession has been taught to conduct all deliveries with the same technic as major surgical operations, and that rectal should replace vaginal examinations whenever possible, yet puerperal infection still occurs in spite of the most careful supervision, and like the poor, is always with us.

Certain cases of puerperal infection, however, are not preventable and the obstetrician cannot be blamed for their occurrence. The gonococcus often causes a stormy puerperium after having existed for years in the female generative tract without giving rise to any serious symptoms. Although there is a difference of opinion among authorities as to the possibility of autogenous infection yet it seems permissible to assume that ascending puerperal endometritis may occur as a result of the presence of pyogenic organisms in the vagina. The possibility of hematogenous puerperal endometritis has been established, and an example from this service was recently reported by Johnston and Morgan. While such occurrences are rare, yet, its possibility must be considered and the attempt made to rid the pregnant woman of all foci of infection, so that organisms may not gain access to the puerperal uterus, a *locus minoris resistentiae*. We shall dismiss from consideration those cases of unpreventable puerperal fever and discuss the factors which may play a part in a normal delivery.

In order to familiarize one's self with the routine employed in the

care of an obstetrical case in the hospital, a brief account of the usual technic is necessary. The patient having been observed in the prenatal clinic enters the hospital at the onset of labor. The nurse shaves the pubic hair, scrubs the external genitalia and the inner sides of the thighs with green soap and water; and, if labor is imminent or a vaginal examination is necessary, the preparation is completed by pouring sterile water, alcohol and a weak solution of bichloride of mercury over the vulva and adjoining area. Rectal examinations are made routinely, and vaginal examinations are allowed only for the instruction of students or in the presence of some abnormality. The latter are made under the supervision of a member of the house staff. At the time of delivery every effort is made to preserve a sterile field, as well as to prevent the contamination of the vagina by the introduction of fingers and instruments. A primary repair is made whenever perineal laceration occurs. During the puerperium the bowels are kept open by catharsis. Vaginal and intrauterine douches are rarely if ever used. Temperatures are recorded every four hours; and, if an elevation of 100.4° or above occurs on two successive days, excluding the day of delivery, the puerperium is arbitrarily designated as febrile. In such cases, every effort is made to ascertain the cause of the elevation and puerperal infection is assumed when all other organs have been found normal.

In order to study the factors which may play a part in the causation of puerperal morbidity, the histories of 1059 labors occurring in the Obstetrical Department of the Johns Hopkins Hospital during part of the years 1918, 1919, 1920 were analyzed, thus establishing an average for the work of three groups of internes. These figures do not include abortions, cesarean sections, admissions postpartum, or patients in whom the elevation during the puerperium was attributed to some intercurrent disease or localized infection other than the uterus or its appendages. Cases of eclampsia are also excluded because Kellogg has recently claimed that the incidence of uterine infection is very much increased in toxemic patients.

TYPES OF DELIVERY

In the series there were 128 operative deliveries, exclusive of cesarean section, while spontaneous labor occurred in 931 instances. In the former the morbidity was 39.1 per cent, while in the latter it was 18.9 per cent (Table I). In other words, in our series, operative interference doubled the incidence of morbidity as one would expect. Dorman and Lyon recently reported the morbidity at the Woman's Hospital in New York as 17.5 per cent, Keukenschriever and Doosenbos found a morbidity of 16 per cent in 1000 cases of labor in Javanese women, which is approximately the same as in our series (18.9

per cent). Hereafter, because of the numerous uncontrollable factors, operative cases will be eliminated from our discussions.

TABLE I

Puerperium	Operative		128 cases	Spontaneous Deliveries		931
	Afebrile	78	60.9 per cent	Afebrile	756	81.1 per cent
	Febrile	50	39.1 per cent	Febrile	175	18.9 per cent
	Total	128		Total	931	

Vaginal Examination.—As previously stated, rectal examinations are made routinely, and vaginal examinations are employed only for teaching purposes. However, in spite of the use of sterile rubber gloves it was found that where vaginal examinations were made, the morbidity was 22.9 per cent in contrast to 16.4 per cent in the patients not examined vaginally. This increase of 6.5 per cent morbidity makes one realize that vaginal examination under any circumstance is fraught with danger to the parturient woman.

TABLE II

Vaginal examination			No vaginal examination		
Afebrile	270 cases	77.1%	Afebrile	486	83.6%
Febrile	80 cases	22.9%	Febrile	95	16.4%
	350	100%		581	100%

Perineal Lacerations.—A careful inspection of the perineum is made after each delivery and lacerations are repaired whenever they occur. The postpartum care of the perineum is minimal, due to the fact that Plass has shown that frequent "pitcher douches" give poorer results than if the perineum is let alone. The resistance of the perineal region to infection is generally recognized and the part played by infected lacerations in morbidity is practically *nil*. It is also evident from our observations that tears play very little part in the causation of morbidity, as is shown by the fact that of 361 cases with perineal lacerations 65, or 18 per cent, had febrile puerperia as contrasted with 19.3 per cent in 570 cases with the perineum intact. Table No. III shows this in detail:

TABLE III

Perineum Lacerated			Perineum Intact		
Afebrile	296	82%	Afebrile	460	80 %
Febrile	65	18%	Febrile	110	19.3%

Premature Rupture of Membranes.—Rhode considers that the escape of amniotic fluid does not play a rôle worthy of consideration in the causation of fever. Dorman and Lyon also reached the conclusion that the length of time that the uterus is drained is in itself a negli-

gible factor in the causation of morbidity, but in our experience premature rupture of the membranes is consistently followed by morbidity in proportion to the number of vaginal examinations. Slemons, however, on the other hand found that prematurely ruptured membranes played an important rôle in placental bacteremia. From our observations, in premature rupture of the membranes the morbidity percentage is increased as shown in detail by Table IV.

TABLE IV

Membranes ruptured prematurely			Membranes ruptured normally		
Afebrile	123	76.95 per cent	Afebrile	633	82.1 per cent
Febrile	37	23.15 per cent	Febrile	138	17.9 per cent
	160			771	

Consequently, until more convincing observations are made, it seems permissible to conclude that premature rupture of the membranes, in the absence of vaginal examinations, intrauterine manipulation and prolonged labor, plays very little if any part in the causation of morbidity.

Catharsis.—McPherson in a series of 1800 patients found that catharsis routinely after the first day of delivery, increased the morbidity percentage, but in a very limited number of cases in which castor oil was given routinely the day after delivery to every alternate case, it was our experience that the care of the bowels played practically no part in the causation of morbidity. Table V is self-explanatory.

TABLE V

40 with catharsis			40 without catharsis		
Afebrile	32	80%	Afebrile	31	77.5%
Febrile	8	20%	Febrile	9	22.5%

All of these patients were delivered spontaneously and the factors previously discussed occurred in approximately the same proportion as encountered in the first series of cases.

DISCUSSION

It seems to be a constant finding that in every one hundred spontaneous deliveries there are approximately nineteen women who have an elevation of temperature of 100.4° or above on two successive days, and in view of the conditions previously discussed there appeared to be very little hope of reducing such morbidity. It was a general impression on the part of members of the staff that women delivered precipitately before any preparation could be made rarely had febrile puerperia. Lankford, in a plea for the use of iodine in the preparation of women for delivery, describes how the use of soap and water

tends to wash contaminating material into the vagina, especially in multiparae; so it seemed plausible to assume that the routine preparation employed in our clinic might possibly be harmful rather than beneficial. In an effort to substantiate this assumption the routine preparation was purposely omitted in forty-four consecutive cases, and it was found only four of them or 9.1 per cent had a febrile reaction. In view of this, it was decided to extend our experience in this respect by omitting the routine antepartum preparation in every alternate patient, clipping only the vulval hairs, and then compare the results obtained in the two series. In instances where the temperature elevation could be definitely assigned to mastitis, pyelitis, or other causes than puerperal infection the cases were eliminated without serious change in relative results.

This was done in 389 cases, and the table below shows the results obtained.

TABLE VI

Routine preparation			No preparation		
Afebrile	164	83.7 per cent	Afebrile	169	87.6 per cent
Febrile	32	16.3 per cent	Febrile	24	12.4 per cent

In Table VII are given the results obtained by employing all cases used in this paper.

TABLE VII

Prepared			No preparation		
Total	Febrile	Per cent	Total	Febrile	Per cent
931	175	18.9			
(40 with catharsis	9	22.5	44	4	9.1
(44 no catharsis	8	20			
196	32	16.3	193	24	12.4
1207	224	18.7	237	28	11.8

From so limited a number of cases one scarcely dares to draw binding conclusions. However, as the incidence of vaginal examinations, premature rupture of membranes and perineal lacerations was the same as before, it seems permissible to conclude that slightly better results follow the omission of the routine preparation, and that contamination incident to its employment might explain the difference in morbidity. Further investigation along this line will not be amiss.

In an effort to procure a better method of preparing patients for delivery one naturally considers the qualities of the different skin antiseptics. The disadvantage of tincture of iodine in such cases is apparent. Brown, Cassegraine, Gibson and others, found picric acid very efficient and enumerate its advantages as follows: Nonirritating to the skin, much cheaper than iodine, four times as bactericidal as carbolic acid, can be used after water. Hewitt in recent experi-

mental studies found pieric acid one of the best antiseptics for rendering the skin sterile, especially when it has been previously treated with ether. Granting our routine preparation may be at fault and in view of the advantages of pieric acid, it seems that its employment might give better results than have previously been obtained. Further study should be undertaken to either prove or disprove this point.

SUMMARY

1. Our findings indicate that many factors play a part in the causation of morbidity.
2. Operative interference doubled the incidence of morbidity.
3. Vaginal examination, regardless of sterile gloves, increased the danger to the patient.
4. Catharsis and laceration of the perineum ordinarily do not influence the puerperium.
5. The increase in morbidity in the cases of premature rupture of the membranes is due most probably to other factors and not to the length of time the uterus is drained.
6. Better results were obtained in a limited number of patients not prepared routinely.
7. The use of pieric acid theoretically may give excellent results in the preparation of patients for delivery, and further study of results following its use is indicated.

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DOES THE OVUM OR CORPUS LUTEUM CONTROL THE OVARIAN AND UTERINE CYCLE?*

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IN experimental work on rabbits done several years ago, I could demonstrate that extracts of the corpus luteum, which are on the market in glass ampules, when injected into female rabbits in the proper doses, exert specific reactions in the genital organs. I performed these experiments in the early winter, during the season when reproduction is not active and used the precaution to employ rabbits which were not fully matured and not over six months old. Nearly every one of them showed, after injection of two c.c. of the watery corpus luteum extract during seven consecutive days, a condition which simulated that of heat, not only in the behavior of the animal, namely, marked nervousness, but also in the decided enlargement and hyperemia of the uterus and tubes, in micro- and macroscopic changes of the mucosa of the uterus similar to those before heat, and changes of the vagina and mamma. At no time was I able to detect hemorrhage from the vagina or secretion in the mammary glands. The histologic examination of the ovaries of these rabbits did not give constant enough changes to permit me to make any conclusion concerning the action of the watery corpus luteum extract upon the ovary. Other investigators, using emulsions of corpus luteum or ether and acetone extracts, report reactions in the ovaries such as increased precipitate, maturing of follicles, and increased cell activity in the interstitial gland.

In the early winter of this year I continued these experiments. Rabbits, which had been castrated six days previously, were injected subcutaneously with the same amount of watery extract of corpus luteum for the same period of time, but no changes in the uterus, tubes or vagina, or in the mucosa of the genital tract could be detected. This different outcome of the experiment in the normal and castrated animals gave me a stimulus to investigate these findings and the probable cause of them, and to study the correlation between the corpus luteum and menstruation and the probable influence of the corpus luteum upon the ovarian and uterine cycle.

It is estimated that there are from four hundred to eight hundred thousand primordial follicles in the human ovary, and many millions in some of the lower animal species. Nature provides everything in abundance, if we consider, that in the human only five to

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six hundred ova finally mature. While the majority of the follicles after growing to a certain size, degenerate before maturing and become atretic, a few undergo progressive changes and mature. In the maturing follicle, proliferation occurs in the granulosa cells, representing the epithelial part of the follicle, and in the theca cells, the connective tissue cells which surround the follicle. The cytoplasm of the cells of the theca increases; the cells grow larger, polygonal, and take up the stain more readily. The capillaries of the theca proliferate and grow up into the granulosa. The granulosa cells, which in the quiescent state are cuboidal or low cylindrical, hypertrophy; they become higher, lipoid accumulation takes place, and the whole granulosa zone increases several times in breadth. The capillaries from the theca enter the granulosa and the fine layer of lutein cells now already present, penetrating to the liquor folliculi. Some of the capillaries may rupture, thus increasing and staining the liquor folliculi. The whole follicle increases in size, comes from the depth to the surface of the ovary, and protrudes above the surface level; the albuginea and its epithelial layer are thinned and their capillaries are compressed; the granulosa cells of the discus oophorus become liquefied and finally rupture of the follicle takes place, setting free the ovum; ovulation has occurred.

The time of ovulation varies physiologically in different women and often in the same woman; while probably the thirteen to fifteen day type is the most frequent, variations from the eleventh to the twenty-third day after menstruation have been observed. Macroscopic observations made at the operating table, microscopic study of the ovary after extirpation, changes following artificial castration and the use of x-ray and correlation between the histologic picture of the endometrium and the period of intermenstrual pain, bring this last named phenomenon into relation with the process of ovulation and not, as formerly held, with an existing endometritis. The physical and mental condition of the woman; the condition of the albuginea whether thin or thick; inflammatory exudates around the ovary; mechanical irritations, as coition; and inflammatory conditions might explain the wider physiologic variations noted. Inflammatory processes of the basilaris of the endometrium, so-called endometritis, might change the normal cycle somewhat, but only to a certain extent. Inflammation might change the histologic picture of the decidua menstrualis as regards size and number of glands and quantity of secretion, but the clinical picture of the cycle is not necessarily considerably disturbed.

The rupture of the follicle suddenly changes conditions. The follicle cells of the granulosa and the ovum, which until now have been mutually interdependent and have reacted upon each other by osmosis and diffusion, become separated: they can influence each other

from now on only by way of the blood stream. With the rupture of the follicle, slight hemorrhage occurs into the follicle and into the peritoneal cavity. Of greater importance is the sudden growth energy, which manifests itself by great proliferation of the granulosa, and to a lesser degree of the theca cells, which is more of the nature of hypertrophy than hyperplasia. Lutein is freely accumulated, the epithelial cells of the granulosa being changed into lutein cells. Lipoids at this stage of the formation of the corpus luteum are not found in greater quantities. The organ thus formed is the corpus luteum. Its life is from twelve to sixteen days. At the end of the fifteenth day, which is the twenty-eighth day of the cycle, the corpus luteum is at the height of development.

During the existence of the corpus luteum no maturing of follicles takes place, no follicles rupture and the corpus luteum takes over their function as a gland. This repression is undoubtedly due to an hormonal action of the corpus luteum. While there are other conditions which have a similar repressive action upon maturing of follicles as anemia, tuberculosis or lactation, in which it would not be necessary to look for hormones as the repressive cause, the fact remains, that in the presence of a corpus luteum no maturing of follicles takes place.

With the death of the ovum, when not impregnated, regressive processes, fatty and hyalin degeneration set in suddenly in the corpus luteum, and sooner or later nothing but a corpus albicans is left as the remnant of the corpus luteum. With the appearance of degenerative changes in the corpus luteum, menstruation starts. Thus we approach the uterine cycle.

Uterine Cycle.—With the advent of the corpus luteum, changes take place in the mucosa of the uterus. During the first four days after the last menstruation the uterine mucosa is at rest, a state of quiescence exists. The remnant of the mucosa is very thin, three-quarters of the mucosa having been lost by the desquamatory process called menstruation, and nothing but a thin layer, the basilar membrane, is left to reproduce the new mucosa. By the end of the fifth day the basilaris is covered again by an epithelial layer. From the sixth to the fourteenth day after menstruation the mucosa grows, becomes three to four times thicker, the glands increase in length and are straight, and stroma is scant. There is no sign of function or secretion of the glandular cells. After the sixteenth day and more so after the eighteenth day, a rather sudden change sets in. Evidences of secretion are present, stroma cells hitherto quiescent begin to grow and hypertrophy, the glands begin to fold and convolute, and the cells are infiltrated by lipoids and glycogen. This process results in the formation of the decidua menstrualis, better

called *prægraviditatis*. These sudden changes in the endometrium coincide with the beginning of the formation of the corpus luteum, their height coinciding with its florescent state. While the stage of the proliferation of the endometrium coincides with the maturing of the follicle, the stage of onset of secretion, of folding of the glands, and of stroma hypertrophy, in short, the formation of the decidua menstrualis or *prægraviditatis*, coincides with the florescent state of the corpus luteum. The nest for the ovum in case of impregnation has been formed, the uterine mucosa has been transformed into the decidua *prægraviditatis*, there is ample secretion and ample nutrition for the ovum. If the ovum becomes impregnated, the corpus luteum proliferates still more and becomes transformed into the corpus luteum graviditatis. The decidua likewise proliferates during pregnancy. If the ovum dies, the corpus luteum rapidly regresses, degenerating by fatty and hyalin change until nothing is left but a corpus albicans. With the beginning of degenerative changes in the corpus luteum, menstruation sets in. Menstruation is certainly not the final purpose, not the goal Nature strives at. It is the acknowledged failure of Nature; it is an abortion of the unimpregnated ovum and the expulsion of the decidua *prægraviditatis*. Decidua formation is nothing less than a preparation for pregnancy, a nest formation for the ovum; if impregnation does not occur, the function of the decidua is ended. These processes are so regular and follow each other in such definite succession, that it is possible from the histologic picture of the corpus luteum to make conclusions as to the stage of the menstrual cycle. Postmenstruation and postpartum the endometrium offers a picture nearly analogous; there are, indeed, quantitative differences, but the only growth difference is at the site of placentation. Furthermore, it is nearly impossible macro- or microscopically to differentiate between the decidua menstrualis and the decidua graviditatis of the first few weeks after impregnation.

What has happened to the ovum meanwhile, from the time of the ovulation until menstruation? After rupture the ovum is carried along the fimbriated ends into the lumen of the tube. Here it remains for some time in a state of readiness and then, if not impregnated, dies. How long the ovum can live in the tube is not exactly determined, but theoretical conclusions are allowed. Some authors are of the belief that the ovum, after it has liberated the two polar bodies cannot live longer than two or three days, separated from the protecting granulosa cells; the latter constitute a necessary protection for such an active and energetic cell as the ovum, which through its energy would necessarily arouse reaction and surely attacks from leucocytes, plasma cells and chemicals. It is, nevertheless, most

probable, that the ovum can live for at least two weeks in the body, it carries its own nutrition, the vitellum, with it, and it is capable of taking up nourishment from its surroundings. Even after impregnation, at a time when it suddenly shows great activity and energy, the ovum can take care of itself for several days before it makes close connection with the maternal body.

If we further take into consideration that living spermatozoa have been found in the tubes thirteen days after coitus, and that in the bat, for instance, spermatozoa are found alive and active several months after coitus, we readily can see that we may speak of an optimum time for conception in relation to coition only in a rather wide sense. While it seems that the optimum time for conception would be just in the middle between two menstruations, it also is clear that coition soon after menstruation as well as a few days before the term for the next menstruation could be successful. An old Jewish law forbids coition for seven days after the last day of menstruation and the fertility of the orthodox Jews is well known.

In men, unlike in animals, coitus is not confined to "heat." Menstruation and heat have nothing in common. Heat and ovulation in animals are synchronous. It is the maturing of the graafian follicle that is the stimulus, in animals, for the preparation of the endometrium, and for the hyperemia of the genital organs. In the rabbit, for instance, at the time of heat the endometrium is already in a state of proliferation, which increases enormously after coition and conception with the formation of the corpus luteum and the formation of the decidua. The next two days see great growth and secretion in the endometrium; a decidua graviditatis is formed in the shortest time. In the rabbit, rupture of the graafian follicle most often takes place during coition. If coition does not take place, ovulation does not occur, the liquor folliculi is quickly absorbed, the granulosa and theca cells degenerate and the follicle disappears. The mucosa of the endometrium has up to this point not reached the height of decidua formation and therefore there is really nothing there for destruction, desquamation or cause for hemorrhage. There is no decidua formation, no preparation for nidation as in the human.

This is readily understood, if we consider how loosely the ovum is connected with the mucosa in the rabbit. Here the chorionic epithelium simply lies close to the epithelium of the endometrium, but there is no place of such close intermingling as in the place of placentation of the human. Man and monkeys have a specific position as regards hemochorial placentation. Most animals have an epithelial chorial placentation; after separation of the placenta there is hardly any, or no raw surface as in the human.

In the human being the correlation of ovarian and endometrial changes during the cycle may be summarized as follows: (Fromme.)

4th-15th day of cycle: graafian follicle attains maturity and, dependent upon it and the ovum, the proliferative phase in the endometrium starts.

14th-16th day: ovulation.

15th-28th days: corpus luteum matures to the florescent state and, dependent upon it and the ovum, the endometrium changes to the decidua prægraviditatis.

1st-3rd day: death of the ovum, degeneration of the corpus luteum and desquamation of endometrium—menstruation.

3rd-4th day: state of quiescence. Epithelization of the basiliary membrane, beginning growth of the graafian follicle.

What is the regulatory mechanism; what are the processes on which the sexual cycle depends? Until about twenty years ago all looked upon the ovary as the all important part of the generative organs, regulating the functions of the sex organs through nervous control. This theory of Pfüger, the theory of mechanical stimulation, for so long believed correct, was found incorrect, when Halban and Knauer showed that the ovarian and uterine cycle was not disturbed after transplantation of the ovary and severing of all nerve connections.

Since then we have learned that hormones play a part in the mutual relations between the genital organs as such and between them and the body. We therefore look upon the ovary not only as the reproductive organ but as an internal gland with an internal secretion, not only possessing the function of ovulation and the function of forming and controlling the female sex characteristics, but also the function of stimulating other organs, as the uterus and mammary glands to do their proper share in the reproduction of the species. I will merely mention the fact that a whole chain of endocrine glands has a hand in this function, the thyroid, hypophysis, pancreas, but it would lead too far to go into detail about the sphere and action of each of them.

To which tissue of the ovary can be ascribed the internal secretion, or which of the different structures of the ovary plays the important part? Three tissues are outstanding: first, the ovum with its surrounding follicle, and I am of the belief that it is fallacy to speak of them separately, since they are so closely related physico-chemically and morphologically; second, the corpus luteum; and third, the interstitial gland. Some authors believe the ovum, others the corpus, and another group the interstitial gland plays the leading rôle in regulating the sex life and the sex cycle.

I will speak first of all of the interstitial gland and its status in man.

Comparative histological examination of an ovary of a rabbit ten months old and of a girl sixteen years old, who had menstruated for one year, will give us quicker instruction, than all theoretical

arguing about this subject. In the ovary of the rabbit we see a comparatively large area of tissue stained with sudan, distinctly different from the surrounding tissue stained with hematoxylin. In the specimen from the ovary of the young girl the areas of sudan stained cells are very small and scanty. If we examine with the naked eye the cut surface of an ovary of a matured rabbit, we can see streaks and patches of yellow, formed by cells rich in lipoid and pigment; these cells rich in fatty globules and yellow pigment are the parts which take up the sudan stain. No such picture can ever be seen in the human, if we do not mistake a corpus luteum in the state of regression. The statement can be made, that microscopic examination of many ovaries from women during their active sexual life, pregnancy excluded, shows very little analogous to the well developed organ, which in other mammalia we call the interstitial gland. While in rabbits this interstitial gland at one time makes up about one-half of the whole ovary, in the human we cannot at any time of life call it an integral part of the ovary; it is a rudimentary organ.

Comparative histologic examination of ovaries of different mammalia (Aschner) shows that atresia of the follicles is the antecedent of the so-called interstitial gland, and that there exists a strict parallelism between the fertility, the number of the fetuses born at frequent partuses and the well formed interstitial gland. Those animals which have many young ones have a well developed interstitial gland. On the contrary, those with few offspring have a rudimentary interstitial gland. In man a well developed gland-like organ evenly spread over the ovary does not exist. The higher up in the animal kingdom we go, the more does the corpus luteum become the dominating factor and the more does the interstitial gland step into the background.

In the human ovary we find lipoid containing cells of the theca interna of atretic follicles, but never as a parenchymatous, well developed organ; there is only one exception and this is during pregnancy, during which atresia of follicles is rather commonly found. The question, whether ovulation occurs during pregnancy can in general be denied, but maturing of follicles does occur with subsequent atresia, after they have reached a certain size. The place of the interstitial gland in the human is taken by the corpus luteum.

How quickly our ideas of biologic principles change is best demonstrated, if we recapitulate the opinions about the corpus luteum, which have prevailed during the last twenty-five years. The corpus luteum was thought to be an unimportant product in a stage of degeneration. In 1899 Penant brought forward the idea that the corpus luteum possesses a mechanism which prevents ovulation. Then came Fränkel with his theory, that the corpus luteum is a periodical, four weekly, regenerating gland with an inner secretion, which prepares the uterine mucosa cyclically for the nidation of the impregnated ovum.

and prevents climax precox. After impregnation the corpus luteum remains functional, a necessity for the growing embryo and a further stimulus for the growth of the uterus. If impregnation does not take place, the hyperemia of the endometrium leads to menstruation and the corpus luteum regresses. Fränkel showed that castration of the pregnant rabbit, done during the first six days after coition, will prevent or disrupt pregnancy. A great deal of weight in favor of Fränkel's theory was added by the experiments of L. Loeb, who was able by mechanical irritation of the endometrium of rabbits to produce a decidua-like formation, but only when a corpus luteum in a certain state of development was present in the ovary. In support of Fränkel's theory of the close correlation between corpus luteum and menstruation, he reported the observation, that in six out of seven cases he was able in women, after cauterizing the young corpus luteum, to prevent the next menstruation. But soon this theory found strong opposition. It was pointed out, that the endometrium shows proliferation at the time of the maturing of the graafian follicle, before ovulation and formation of a corpus luteum. It was further pointed out that in animals the corpus luteum bears no relation to the changes in the endometrium, or has such a relation only during a short period after ovulation. Oestrus, the height of the proliferation of the animal uterine mucosa, and heat are nearly identical in time. Of course, Fränkel comes back with the statement, that the enormously developed interstitial gland in animals acts vicariously for the corpus luteum, but this statement holds good only for a number of animal species. In the other animals with no interstitial gland, Fränkel is at a loss with his theory.

In my own experimental work, I was able to produce nearly all changes occurring just before heat by the injection of lutein extract in the presence of a functioning ovary. It would seem that the lutein extract alone could not stimulate the follicles. After castration the lutein had no influence upon the uterus or tubes, proving that the lutein alone was ineffective.

In another series of experiments I could prove that neither the injection of lutein extract, nor the successful transplantation of a corpus luteum into the abdominal wall could prevent the atrophy of the uterus following castration. I, therefore, would say that Penant's supposition, that the corpus luteum prevents ovulation during the time of its existence, seems well established. The corpus luteum continues and increases by hormonal action the stimulus exerted by the maturing follicle and ovum upon the endometrium, increasing this stimulus to a maximum, and through it transforming the proliferated mucosa into the true decidua prægraviditatis, with its lipoid secretion and cellular function. It continues this stimulus during the time of pregnancy. Concerning the correlation of corpus luteum

and menstruation, I lean much more to the opinion of Halban, Köhler and others, who believe that the corpus luteum exerts a directly retarding influence upon menstruation. This finds a very reasonable support in the findings of many surgeons, that frequently a few days following extirpation of an ovary with a corpus luteum, the operated woman starts to menstruate; and in the cases of unilateral corpus luteum cysts with amenorrhea and regular menstruation after extirpation of the cyst; and also in the observation of veterinary surgeons (cited by Ochsner) that not infrequently heat does not appear in cows, until a persistent corpus luteum is compressed and ruptured. Many cases of metrorrhagia of puberty are accompanied by small cystic changes in the ovary, but no corpus luteum can be found, therefore, the hemorrhages.

Experimental work with corpus luteum extracts, points to the fact, that these extracts have a direct action upon the uterus and its mucosa, but according to my own findings only in the presence of an ovary. Everything indicates that the ovum and the follicle regulate the ovarian and uterine cycle by their hormonal secretion; the corpus luteum increases this action through a specific hormone acting upon the uterus. After rupture of the follicle the ovum gets into the tubes or peritoneal cavity and is free from all connections with the body. Thus, freed from all connections, Seitz and others claim it would be impossible for the ovum to exert any further influence upon the body by hormone action; it dies and hence could not produce regression in the corpus luteum and menstruation. But we may answer to this objection, that we have to suppose that the hormones secreted by the ovum and absorbed by the mucosa of the tubes, are ferment-like substances, real enzymes or activators. If this be the case, there is no necessity that they have to be present in any appreciable amount.

In conclusion it can be said: Ovarian and uterine cycles stand under the omnipotent rule of the ovum and follicle. The ovum is the beginning and the end of all sexual function (Maier); it predestines in the early embryonal life the formation of the female organs and the female sex characteristics; later on all the general as well as the biologic changes during the period of active sex function are under its domain.

The true decidua prægraviditatis, a better name than decidua menstrualis, is the result of hormonal action of the corpus luteum.

Menstruation is a derailment, a result of a failure of Nature; it occurs when the ovum does not become impregnated.

Corpus luteum extract as on the market produces hypertrophy and hyperemia of the uterus and tubes, but only in the presence of ovaries. Theoretically its greatest therapeutic result ought to be expected in meno- and metrorrhagias and hypoplasias.

Society Transactions

AMERICAN GYNECOLOGICAL SOCIETY

FORTY-SEVENTH ANNUAL MEETING

WASHINGTON, D. C., MAY 1, 2, 3, 1922

(Continued from November issue.)

Symposium on Obstetric Problems

DR. BENJAMIN P. WATSON, Toronto, Ont., presented a paper on **Further Experiences with Pituitary Extract in the Induction of Labor.** (For original article see page 603.)

DR. M. PIERCE RUCKER, Richmond, Va., presented a paper on **The Action of Ergot and Hypophysis Solution on the Uterus.** (For original article see page 608.)

DISCUSSION ON THE PAPERS OF DRS. WATSON AND RUCKER

DR. RUDOLPH W. HOLMES, CHICAGO, ILLINOIS.—I shall confine myself to remarks relevant to the paper of Dr. Watson. My practice has been to induce labor largely on two of his indications, namely, the toxemias of pregnancy, and distress, discomfort and insomnia which may be incident to the latter days of pregnancy. Up to ten years ago, very frequently, if there were minor cephalopelvic disproportions, I induced labor four weeks before estimated term. In later years the practice has been largely discarded. My impression is that I have had no untoward effects to mother or baby from such practice, done for pelvic indications. When done earlier, as was the vogue twenty years ago, the prematurity of 32 weeks or earlier brought an occasional disaster to the baby.

As regards the first indication, I wish I could reconcile myself to it. My teaching for many years has been that true postmaturity was an extremely rare event. We know not when pregnancy begins, therefore, we cannot definitely fix the day of confinement. In the classroom this graphic illustration is given the class: it takes 24 hours for a train to go from Chicago to New York. What time does it arrive? The astute student demands the time that it left the first city. So it is with the estimated date of confinement, ignorant of the moment of conception we have fallacies of our computation of the date of confinement.

I saw one woman in whom it was possible to determine the approximate time of conception within a day of the fruitful coitus. The first two pregnancies were characterized by a most distressing ptyalism. In her third pregnancy ptyalism appeared the day following her husband's return from a protracted absence. We all see many women who go beyond the calculated date of expected confinement. This is very different from a true protracted gestation. An overlarge baby does not attain this growth in the last week or two. The growth is progressively proportionate during the months of pregnancy.

DR. N. SPROAT HEANEY, CHICAGO, ILL.—Here we are considering methods of the induction of labor, and I think it must be conceded that the induction of labor is justifiable under certain conditions; also that there is such a condition as post-maturity, and that we need not consider how to arrive at these opinions.

My inaugural thesis before this Society was on pituitrin and ever since that time I have been much interested in its use and have had a great deal of respect for its action. After a lot of earlier difficulties, I discarded pituitrin entirely, excepting in the conduct of the third stage of labor. Some of our members recently advised "microscopic" doses of pituitrin, however, for the induction of labor and I have cautiously resumed its use for this purpose. One particular thing that has attracted my attention in the induction of labor is that frequently patients, after having been given quinin and more especially pituitrin extract, will suffer intensely and have hard pains without any progress. They may have intense labor pains for a considerable length of time and the pains will not produce any effacement or dilatation of the cervix. In other words, while pains may be produced, they may not be the proper kind of pains. Patients are now watched carefully after the giving of quinin or pituitrin and if no progress is apparent within a few hours, morphin is given the patient, and the indications for the induction of labor are studied anew. In this way I have obviated some of the disagreeable consequences of induction of labor and have saved myself much perplexity and my patients much suffering.

DR. ARTHUR H. MORSE, NEW HAVEN, CONNECTICUT.—We have been very much interested at Yale in Dr. Watson's previous papers upon the induction of labor by means of the administration of pituitrin. However, we have not quite dared to make use of it. I think in a previous paper Dr. Watson suggested that the drug would be useless as a means of inducing abortion. We have tried it in several cases of incomplete abortion to see whether or not it would cause expulsion of the retained placenta, but we have not been successful in accomplishing this. So it appears that our results confirm what Dr. Watson had already suggested.

I have been interested in Dr. Rucker's paper because he has attacked his problem from the standpoint of the pharmacologist. I have been wondering whether the curves which he obtained were due entirely to contractions of the uterine muscle; or whether an error crept in as a result of the contraction of the abdominal muscles. I shall be interested to hear from Dr. Rucker on that point. One interesting thing he has pointed out is this: the action of pituitrin is more marked toward the end of pregnancy than in the earlier months. Possibly other factors play a part here. Several years ago it was pointed out that the calcium salts appear to play a definite rôle in the causation of labor and in a series of cases which we have been studying, we have found an increase in the calcium of the blood toward the end of pregnancy. It appears possible that the activity of the pituitary extract in the later months of pregnancy may be bound up with this increase in the calcium content of the blood.

DR. CAREY CULBERTSON, CHICAGO.—Like Dr. Holmes, I am interested to know exactly what Dr. Watson means with reference to maturity or postmaturity, although I hesitate to bring up the question. We discussed this subject at length in the Chicago Gynecological Society a year or more ago, and arrived at no definite conclusion as to what these terms mean.

As regards the methods of Dr. Watson, in my own experience quinin and castor oil have been effective in a large number of cases, in fact, in a larger number of cases than in the series he has given here.

I have used pituitary extract as a method of induction of labor, very cautiously, and its use has been attended with no misfortune thus far. I have used rubber bags in a considerable number of cases and have had enough misfortune, so that

today I employ them, as Dr. Watson properly indicates, in relatively few cases, where conditions are favorable and the indications definite. I no longer use the bag for arbitrary induction of labor at term.

DR. WILLIAM C. DANFORTH, EVANSTON, ILLINOIS.—When Dr. Watson described his method two years ago I felt as I think other members did, that it was a method which should be approached with some conservatism. I have, however, tried it in a series of cases not so great as his, but have not had the boldness to use quite the same dosage. We have used the castor oil and quinin as indicated and have supplemented this by three minim doses of pituitrin every thirty minutes up to three times unless the patient were sooner in labor. Only once or twice has this number been exceeded. This we tried in about 25 multiparae and were successful in causing labor to begin in about 80 per cent. In none of these cases did we have any trouble traceable to the use of pituitrin.

We have, later, also tried it in a smaller number of primiparae with not quite so great a percentage of success. I have been very greatly interested in reducing the number of bag inductions, as I feel that any method which can offer a sufficient degree of safety and which will permit us to dispense with mechanical means is to be welcomed. We were able last year in 500 cases to reduce our bag inductions to nine, the bag being used only in case of placenta previa and toxemia in which we felt that rapidity of action was essential, and in some of whom castor oil, quinin and pituitrin had failed.

In some of these the action of the bag was disappointing. Where the bag is used only in cases which have failed to respond to less active methods, it necessarily is applied in cases which may be refractory to any means, hence its percentage of successes would be lower than in services where it is more routinely used.

DR. FRANK W. LYNCH, SAN FRANCISCO, CALIFORNIA.—Our results in inducing labor by castor oil and quinin differ so much from those of Dr. Watson that I would like to give them.

We became interested in this question several years ago and began to record our cases so that we might know what proportion of pregnancies at term went into labor following castor oil and quinin. About 350 of these were reported by Dr. Maxwell in an article which reviewed our induction of labor cases with bags. We now have nearly 500 cases of pregnancies at term, which were given castor oil and quinin. We give an ounce and a half of castor oil at 5 o'clock in the afternoon, and 5 grains of quinin an hour later, and 5 grains an hour thereafter. Labor followed in twenty-four hours in two-thirds of the primiparae and in three-fourths of the multiparae.

PROFESSOR W. L. WILLIAMS, ITHACA, NEW YORK.—I find obstetricians generally teach definitely regarding the duration of gestation. The veterinarian does not find that to be true at all in domestic animals. The period of conception is definite because copulation takes place only when the graafian follicle is mature, and just prior to menstruation should pregnancy fail to occur. In the various species of domestic animals the variation in the duration of gestation runs parallel with the average duration of gestation; that is, in some of the small animals the variation in duration of pregnancy is only two or three days. In the cow the duration of gestation varies from 270 to 290 days. In the mare it is from 300 or 330 up to 360 and even 365 days. The general impression is that the fetus grows rapidly during the final stage of pregnancy, and so veterinarians have sometimes thought of inducing labor in mares in which pregnancy seems too long, in order to avoid the excessive stress on the mother. The greatest duration of pregnancy I have observed in a mare was 365 days, and the young was a pigmy, so that excessive size of fetus does not always follow in prolonged pregnancy.

DR. FRED L. ADAIR, MINNEAPOLIS, MINNESOTA.—In 1916 I wrote a short article on the induction of labor with fractional doses of pituitrin, and have used the drug in uncomplicated cases since then. It was effective in uncomplicated cases, without rupture of the membranes, except in those patients who were at or near term. I used pituitrin then in doses not to exceed four minims at intervals of one-half hour, and if labor was initiated the pituitrin was stopped. On the other hand, if it was not initiated, it was continued until six or eight doses had been given. If you cannot start labor with small doses of pituitrin, it is better to cease administering it. We have also used castor oil and quinin. A safer method of administration is to begin by giving castor oil in doses from half an ounce to an ounce, depending on the individual susceptibility to the action of cathartics, at the same time giving five grains of quinin, and repeating the quinin in five grain doses, at intervals of four hours for four or five doses, unless the patient develops signs of cinchonism. In the cases in which there is no urgency in inducing labor, we try the castor oil and quinin, and if that fails, we try fractional doses of pituitrin, and if sometimes there is failure by these methods, we are warranted in using the more effective methods.

As to the useless suffering of the patients from the use of pituitrin, I have found that the bougie and bag are not always efficacious. These patients not infrequently have pains with the bougie and bag and when they are removed or expelled the pains stop. I think the objection raised by Dr. Heaney in regard to the use of pituitrin also applies to other methods of inducing labor, but perhaps in less degree.

DR. ALFRED B. SPALDING, SAN FRANCISCO, CALIFORNIA.—May I ask Dr. Watson what sort of quinin he uses for the induction of labor and in what manner the solution is given?

DR. WILLIAM E. DARNALL, ATLANTIC CITY, NEW JERSEY (by invitation).—In all this discussion on the induction of labor I have noticed that there has been a conspicuous absence of the use of the Barnes bag for the induction of labor, and I want to know from Dr. Watson if he has given up this method.

DR. WATSON (closing).—A good deal of discussion seems to center around the indications for the induction of labor in these cases, particularly postmaturity. We do not know what the duration of human pregnancy is. What I teach is, that if the pregnancy is prolonged beyond the calculated date of labor, that patient ought to be carefully observed every week at least, after she has passed term, and if there is any indication at all that there is a growing disparity between the head and pelvis, labor ought to be induced. In a great many of these cases coming under the fourth heading, distress is common, and those patients that go beyond term have that distress. There is in addition to that a great deal of inconvenience.

Regarding the postponement of labor, I have found this method so safe in such cases that I do not hesitate to use it. I do not for a moment think that all patients, who go beyond the calculated date of term, or the majority of them, really have postmature children.

With regard to the results obtained by quinin alone, Dr. Lynch mentioned his results, and possibly mine will correspond with his, but I do not wait twenty-four hours after quinin has been administered before I begin the administration of the pituitrin. Perhaps I am a little over-enthusiastic with pituitrin and cannot wait sufficiently long to see what the effect of the quinin is going to be.

Dr. Heaney remarked in regard to the suffering of these patients, and some one else stated that the same thing applied to the use of bags and bougies. I agree with them that in premature cases there is a great deal of distress, with no results,

and we cannot expect a result from quinin and pituitrin until there is opening of the cervix, and then labor will go on.

DR. KEDARNATH DAS.—I should like to ask Dr. Watson in connection with postmature cases, how many were primiparas and how many were multiparas?

DR. WATSON (resuming).—I have not the exact figures at my command, but a very considerable number of these were primiparous patients who had gone beyond term.

In reply to Dr. Spalding, the solution of quinin I use is quinin hydrochlorid, dissolved with 10 minims of hydrochloric acid to 10 grains of quinin. Patients object to the taste, but they are willing to put up with that with the prospect of a fairly rapid termination of their pregnancies.

In answer to Dr. Darnall, we use the bags and catheter or bougies occasionally, but we have occasional failures. If a bag is used the patient has pain, and when the bag is taken out the pain ceases. One-half c.c. of pituitrin administered at that stage will effectively start labor, and I think the use of pituitrin in such cases is a very good thing.

DR. RUCKER (closing on his part).—With regard to the question of Dr. Morse, in the first stage observations you can definitely identify the contractions. The uterine contractions are long wave-like contractions, while the contractions of the abdominal muscles are of the short up and down type. They are mere lines on the record. In the postpartum or third stage observations, where you get marked contraction of the uterus, there is a noticeable depression which is maintained for a minute or more. The same thing is done with the abdominal muscles, but for shorter intervals. The respiratory action of the abdominal muscles may mask a slight contraction of the uterus.

The thing that started us off was that ergot gave such slight results as compared with the action of pituitrin. We tried to measure the difference in the effect of ergot and pituitrin. If you use large enough doses, say three times as much ergot as the ordinary dose, you get a pituitrin-like effect.

Dr. Joseph Tabor Johnson in a paper on ergot presented before the Society in 1882, made the statement that mankind would be a great deal better off if ergot was abandoned. If that statement is true of ergot, what shall we say of pituitrin, which is a much more powerful drug?

DR. GEORGE W. KOSMAK, New York, presented a paper on **Intrauterine Rupture of a Velamentous Umbilical Cord**. (For original article see page 619.)

DISCUSSION

DR. M. PIERCE RUCKER, RICHMOND, VIRGINIA.—Shortly after getting a copy of the program I had a case which may be of some interest to relate. It was a normal delivery. The cord was clamped; the patient started to bleed. I pressed on the abdomen, and about three or four inches from the vulva the umbilical vein rupture and spurted blood all over the nurse. This case shows the ease with which these things may happen. There was no undue pressure made on the fundus.

DR. ALFRED C. BECK, Brooklyn, N. Y., by invitation, presented a paper on **Is Interference Justifiable after Twenty-four Hours of Labor When No Other Indication Is Present?** (For original article see page 623.)

DR. RUDOLPH W. HOLMES, Chicago, Ill., read a paper entitled **The Test of Labor in Relation to Cesarean Section**. (For original article see page 579.)

DISCUSSION ON THE PAPERS OF DRS. BECK AND HOLMES

DR. REUBEN PETERSON, ANN ARBOR, MICHIGAN.—With regard to Dr. Beck's paper, it is the kind we ought to have more frequently, for the reason that it deals with a large number of cases treated conservatively. During the past twenty-two years we have been very conservative in the University of Michigan Maternity, in spite of the fact that I have been credited with being a radical in regard to eclampsia. I will say that in our clinic we find by actual experience that the morbidity and sometimes mortality is increased by early rupture of the membranes, consequently we were between two fires. We still went on with our conservative work, but the higher temperatures and morbidity persisted, consequently I welcomed with a great deal of pleasure Dr. Beck's low cesarean section operation, which I think is a great advance in obstetrics, in spite of the fact that Dr. Holmes has never done one and says he never will do one. Here is an operation where, if the test of labor fails, you can open the uterus low down with a minimum amount of trauma. Because of our conservatism, I have only done this operation five or six times. Technically, it is an easy operation to perform, and it is the kind indicated in the particular class of cases Dr. Beck has pointed out, where the woman has been in labor for a long time and is unable to give birth to the child. We do not use vaginal examinations in our clinic cases; consequently in cases where we do have to perform cesarean section we have not contaminated the vagina.

I have no criticism to offer in regard to Dr. Holmes' work with such an array of figures as he presents. We should have more time to study these figures. However, I cannot conceive of removing the appendix at a cesarean section. That is diametrically opposed to all good surgery, unless the woman has an acute appendicitis. Why should you contaminate the field with removal of the appendix in a cesarean section? It seems to me, the pendulum is swinging back to conservatism. It is necessary to go through this period of radical methods in order to swing back to sane methods, but surely that day is coming, and from now on we are going to give women in labor a chance, being ever ready to help them surgically, when necessary.

DR. RALPH H. POMEROY, BROOKLYN, NEW YORK.—As Dr. Beck's confrère in the Borough of Brooklyn, it would be unfair for me not to express myself in regard to this matter.

So far as publication is concerned, I suppose I am considered to be a reckless radical with dilating bags and perineotomies and rotation of posterior positions, instead of letting them alone, but I am not. I am ultraconservative and only want to apply my practice to the absolutely indicated selected situations, and I hope ultimately my apparent radicalism will simplify a few of the cases in which radicalism is indicated.

DR. N. SPROAT HEANEY, CHICAGO, ILL.—I want to congratulate Dr. Beck on the work shown, because if the spread of radicalism continues, there will be no place for the physiology of labor and the future obstetrician will have no experience on which to base the indications for his operations. I wonder at Dr. Beck's temerity in coming before the Society with such a study as the physiology of labor, in view of the radical tendency of the times.

I wish for the sake of his statistics, in order that they might stand out more

clearly, that Dr. Holmes had omitted the appendectomy. Though I, myself, have not removed the appendix during the course of a cesarean section, I cannot see any particular objection to it. It is largely a matter of viewpoint and much depends upon the individual case.

Dr. Peterson advises that all gallstone pathology should be attended to when met during operations for gynecological difficulties. I do not do this and I wonder at Dr. Peterson's objections to the removal of the appendix while doing a cesarean section in view of his radical advice regarding the gall bladder during gynecological operations. The conditions are, briefly, analogous. I am not saying that Dr. Holmes is right or wrong, but I can see no difference between the two recommendations.

DR. KADERNATH DAS, CALCUTTA, INDIA.—I desire to offer a few remarks on the question of prolonged labor and to draw attention to the fact that the first stage of labor may be prolonged with a low implantation of the placenta with intact membranes. These patients can be allowed to go on for more than twenty-four hours and then, if you make a vaginal examination and feel a soft cervix but the membranes do not bulge, in those cases after twenty-four or thirty hours the simple procedure of rupturing the membranes will quickly expedite labor. I should like to draw attention to that little point, although I do not know whether it is often done or not.

DR. FRANK W. LYNCH, SAN FRANCISCO, CALIF.—The results presented are checked by controls and without control checks our work will never be of a high scientific character. I am not able to discuss properly either paper, since I have not reviewed our material carefully, and I have long since learned that a discussion of a carefully prepared paper is not of much value, if you have not reviewed your own cases. We are too apt to be unduly influenced by the single cases which we keep in mind.

We see very few contracted pelvises in the far west which warrant cesarean section. Most of our dystocias are due to poor labor pains and bad flexions of the head rather than pelvic contractions.

Unfortunately, however, we have a comparatively large series of secondary cesarean sections, since in our part of the country there are many men who do cesarean section on very scant indication. Some do the operation once in every seventeen or eighteen labors. Many of these patients come to us in subsequent pregnancies. We treat them by cesarean since we feel that one cesarean warrants similar treatment subsequently.

Technic seems worth discussing since the cases that die usually succumb from infection. Although we do not make vaginal examinations as a routine even in normal labor, we do not believe that rectal examinations are invariably without danger of infection. Nearly 8 per cent of our cases have some slight fever following labors which have been conducted only by rectal examinations. There is no doubt, but that vaginal secretion from the posterior vaginal wall may be shoved into the cervix during rectal examination. Usually this is not of importance since streptococci are not often found in the pregnant vagina. Not all vaginæ, however, have bactericidal secretions. We, therefore, scrub out the vagina before the operation.

Personally, I do not feel that from the facts in hand we are yet able to advocate either the high or low cesarean. We know much about the high cesarean, and comparatively little about the low. Each man must be governed at present

by the results of individual series of cases. Since it is our aim to avoid or at least beat the infection, it seems that the choice of route is closely related to technic. Much depends upon the firm closure of the uterine incision. I do not feel that sufficient emphasis has been made of the fact that the uterine peritoneal membrane agglutinates in a few hours and, therefore, may limit a uterine infection. Therefore, proper peritonealization must be a basic consideration in any type of cesarean.

DR. BECK (closing on his part).—At the end of this study I had so many figures that they were very confusing. To avoid this confusion and make my points clear I, therefore, considered only the fetal deaths and maternal deaths in studying the end results. As Dr. Peterson suggested, in these long labors, particularly the dry ones, the temperature curve shows an increased morbidity. This is another argument against interference. If this increased morbidity is due to infection, operative interference no doubt would have increased the risk to the mothers by spreading that infection.

I have had considerable experience with the low incision cesarean section technic, and my results together with those of my friends were published a short time ago. Even though the series was small, I feel that we can say that the results are more favorable than would have been obtained had the classical high operation been used. We believe that the low incision properly peritonealized offers considerable protection against the extension of the infection to the peritoneal cavity.

With regard to Dr. Williams' work, I do not think that his observations on the uteri removed at operation proved conclusively that these uteri should be removed. Many of our patients undoubtedly had infected uteri and the great majority not only survive, but fail to have a serious infection. We, therefore, hope that with our technic we can gain the same result without adding the unpleasant symptoms which follow hysterectomy in young women.

For some time we have been making cultures of the amniotic fluid and placenta at the time of operation. We have been surprised to find streptococci present in not a few of these cultures. In spite of these findings the patients lived and did not have peritonitis.

DR. HOLMES (closing).—I thoroughly believe that Dr. Beck's paper by preaching conservatism is more important than mine. Yet, my experience and practice is based on a conscientious attempt to limit cesareans to the cases which demanded intervention at a time when high forceps, eventually craniotomy would surely have destroyed many babies. The whole basis of my paper is on personal experience, and I believe is more important than statistics computed on the results obtained by a questionnaire.

With reference to the removal of the appendix in connection with cesarean section, I cannot see the difference in the incidental removal of an appendix in this connection and its removal as an incidental step in ordinary gynecologic work.

My results speak for themselves. There were no deaths, and the composite temperature curves were just as favorable to the women subjected to it as in comparable cases where it was not done.

We may all agree with Dr. Lynch that rectal examinations may rub the vaginal mucosa with its normal bacterial content within the cervical ring, but it is infinitely less risky than the hazards of a vaginal examination, especially if the examiner does it in a slovenly manner.

DR. CHARLES C. NORRIS, Philadelphia, Pa., read a paper on **Pregnancy in the Tuberculous**. (For original article see page 597.)

DISCUSSION

DR. RUDOLPH W. HOLMES, CHICAGO, ILL.—I wish I could adequately express my appreciation of Dr. Norris' teaching regarding the coincidence of pregnancy and tuberculosis. Naturally, the obstetrician must leaven his opinions on this combination from the experience of those especially trained in tuberculosis work. My conviction is that if any good is to be derived from a therapeutic abortion in a woman afflicted with pulmonary disease, it must be done early. The more recent teaching is that pregnancy liberates certain ferments in the early weeks which tend to absorb albuminous deposits. The early tuberculous lesion is encysted. This ferment is presumed to absorb the retaining wall of the lesion, with the manifestation of a sharp reaction. How much of this explanation is to be proved by time may be debatable, but there is small use in doing a therapeutic abortion for tuberculosis after the third month.

DR. REUBEN PETERSON, ANN ARBOR, MICHIGAN.—I have had the same difficulty Dr. Norris has had in looking over the literature on the subject of tuberculosis in pregnancy and labor and the puerperium. I could not get anything very definite from the literature. That is why I welcome such a paper as this because Dr. Norris has had exceptional facilities in the Phipps Institute and has been able to collect a large number of cases and analyze them. He gives us definite information in regard to the effect of pregnancy on the tuberculous lesion. In my experience, which is limited, only having the cases as they come to the clinic and a few private patients, in tuberculous women who have insisted on continuing pregnancy and having their children, the latter have not been materially affected by the tuberculosis. Consequently my own experience agrees with the conclusions drawn by Dr. Norris. The transmission of tuberculosis to the child through the placenta is very rare.

As to the other point he brought out regarding the induction of labor, I think we have to consider each case separately. We have the problem of the child and the problem of the mother. If the mother and the husband look at it chiefly from the standpoint of the mother and ask that the uterus be emptied early in pregnancy, I think under some circumstances it is our duty to do it. On the other hand, beyond the fourth or fifth month of pregnancy, it seems to me, it is an entirely different question, and obstetricians have the life of the child to consider. This is backed up and strengthened by the statistics Dr. Norris has given us. These women do not do well when the uterus is emptied after the fifth month.

As regards sterilization, tuberculous women should be sterilized under some circumstances if they request it, and I am in favor of this procedure. I do not look upon the giving of a short anesthetic perhaps in the same light as does Dr. Norris. I judge its effects from my experience in anesthetizing tuberculous women with pelvic disease. In the advanced cases any form of general anesthesia acts badly. In the cases, however, that are not so far advanced, they stand a short anesthetic fairly well.

My conclusions regarding spinal anesthesia are about the same as those of Dr. Norris. Although I favor spinal anesthesia and have done it to a limited extent, I still have the same fear about it that he does. I think short anesthesia in women whose tuberculosis is not far advanced can be given and sterilization performed quite safely. This should only be done, however, after it has been explained to the patients that once sterilized they are always sterile, and that tuberculosis is a cur-

able disease. Later on in their lives, if they are cured, they may want a child. That is one of the serious objections to sterilization in this class of cases.

DR. RALPH H. POMEROY, BROOKLYN, NEW YORK.—There are two or three points on which I venture to comment. In doing vaginal or abdominal hysterotomy, which I have done on many occasions in this type of case, in the pulmonary cases particularly I have found it satisfactory to give deep, deliberate, morphin-scopolamin anesthesia, so that the patient's respirations were down to 10 or 12, and then have an expert anesthetist to give chloroform and oxygen in small quantities to the possible point of reaction and agitation on the part of the patient. I have never seen any serious consequences in carrying out operative procedure in this way.

Another comment I would like to make which is purely theoretical, and I do not know whether it has been considered or carried out or not, is with reference to the puerperium which is the serious side of the active progress in the tuberculosis case. The question arises can we accomplish anything by blood transfusion during the puerperium early, or in the progress of the case, to help tide these patients through?

DR. CARY CULBERTSON, CHICAGO.—Dr. Norris' very careful study is of a great deal of value, it strikes me, as far as it has gone, although it has been limited by the fact that it has been impossible to carry the study far enough to make it show exactly where the test comes in. In my opinion the test showing the influence of tuberculosis on pregnancy, labor and the puerperium, is the same as in heart disease, and that is by ascertaining how long these patients live. Information showing such data is not available, and that is where statisticians do not come to our aid. We should have a record of the ages at which 5000 women died of tuberculosis, and another large series of cases of 5000 women who have had one, two, three or four children, and the ages at which they died. We believe that tuberculosis shortens the life of the individual, and if it destroys the life of the mother earlier than it does that of the nulliparous woman, until we have statistics of this sort we cannot show the facts. It is unfortunate that such statistics are not obtainable.

DR. JOHN A. McGLINN, PHILADELPHIA.—There was one point brought to my mind in discussing the paper of Dr. Norris, and that is the statement which Dr. Holmes made, which is not entirely scientific. I am not appearing before you as a missionary in any way, but the question was brought up in reference to the attitude which the Catholic Church assumed in not permitting Dr. Holmes to do craniotomy and insisting on cesarean section, and also the question of therapeutic abortion. We must realize in getting information as to certain beliefs that some theologians do not know theology any more than some historians know history. Often-times we are misinformed about certain beliefs and certain attitudes, but when you come down to the teaching of the church in reference to the question of fetal life, it is founded simply on the Fifth Commandment, "Thou shalt not kill." That is all there is to it. A prominent conception is that we must sacrifice the mother in the interest of the child. That is all nonsense. In Dr. Holmes' case you can no more jeopardize and threaten the life of the woman by doing cesarean section to save the child than you can do craniotomy to destroy the child and save the mother. Practically the only conflict we are up against, for instance, is in operating on our Catholic patients, and it is purely a question of abortion. It is not a question of the child being baptized. Baptism does not enter into the question. It is the rights of the child. Six months is the period of viability, and prior to viability operation cannot be done which will destroy the child. Scientifically, I think we believe now that craniotomy is hardly justifiable in the presence of a living child, inasmuch as we have operations which are just as safe or safer than craniotomy.

In these cases of tuberculosis associated with pregnancy, the question has not been

proved definitely whether a woman's chances are improved by abortion in the early stages rather than allow her to go to term. When you come to sift the thing down, a great deal of our trouble is the misinformation we have in regard to certain things. As I see it, practically the only conflict that exists between scientific medicine and theology at the present time is the question of the indication for therapeutic abortion. The teaching among Catholic patients is that abortion cannot be done prior to the viability of the child. I think scientific medicine has demonstrated up to the present time that there is very little indication for therapeutic abortion in cases of pronounced toxemia which can be properly handled and carried out. A great many cases of pronounced toxemia will die if the uterus is emptied, and if you have reason to believe that there is a conflict, do not accept the word of any person as to what the conflict may be, but seek proper information from those who are qualified to give it, and you will find you have very little conflict in the matter.

DR. NORRIS (closing).—I think that in presenting our paper I have not sufficiently emphasized our search of the literature which comprises an analysis of some 3000 cases. In studying the results obtained by others one is impressed with the results. This is, at least, in part due to the type of cases from which the studies have been formulated. The obstetrician, as a rule, sees the worst cases. The great majority of women are delivered by the general practitioner, or by midwives and early pulmonary tuberculosis is often not recognized by them, or if recognized, is treated along ordinary lines, provided the case does well. If, however, such a case suffers from an exacerbation of the pulmonary condition she is likely to be sent to a maternity hospital or consultation with an obstetrician is secured, and in this way swells the records of the latter. On the other hand, statistics from the interest contain many early cases which would not be recognized unless special diagnostic skill was employed.

We have endeavored to emphasize the necessity for the study of large groups and the fact that erroneous conclusions are likely to be arrived at unless this is done. Dr. H. M. R. Landis and other specialists in pulmonary tuberculosis have informed me that, as a rule, when exacerbation in the pulmonary condition occurs as the result of pregnancy, these are likely to become manifest in less than three months, and this seems to me, logical. All our cases have been followed for at least three months after delivery and many for longer periods, some as long as thirteen years.

As to the question of transfusions, this is very pertinent. I think it an excellent suggestion and hope to employ it more frequently in the future.

THE OBSTETRICAL SOCIETY OF PHILADELPHIA

STATED MEETING MAY 4, 1922

THE PRESIDENT, DR. STEPHEN E. TRACY, IN THE CHAIR

DR. JOHN C. HIRST AND DR. CHARLES MAZER presented a paper on **The Rubin Test and Its Therapeutic Application**. (For original article see page 628.)

DISCUSSION

DR. JOHN COOKE HIRST.—We have not yet examined a sufficient number of cases (the number now being slightly over seventy) really to form conclusions more definite than those that have been stated. Dr. Reuben Peterson, who reports the

largest series of cases, has drawn very much the same conclusions. I have watched most of these cases that have been under our care and have not seen a single unfavorable reaction, especially since the use of carbon dioxide. Up to that time there was considerable pain produced by oxygen injections and I have had no experience with the use of atmospheric air, but I rather think that the same pain would be present. As soon as we changed to carbon dioxide the difference was noted at once. At first we used the fluoroscope in every case, but we find that unnecessary now. While using oxygen the therapeutic test of pain was quite remarkable. We would not tell these patients what to expect, but as soon as they got down on the table they would begin to work and rub the right shoulder. That pain is almost entirely lacking when carbon dioxide is used and as far as any pelvic irritation is concerned we have not as yet seen a single case. Of course the method has to be adapted to those cases in which there is no chronic cervicitis, no chronic leucorrheal discharge, and no evidence of pelvic disease. With a little care in all cases I believe that we need not fear any septic reaction in the use of this method, which has certainly saved us from making quite a number of mistakes. A case in point is a patient who came to my office with a diagnosis of sterility; she has had corpus luteum, she has had ovarian and every possible extract. She has been curetted four times in the last year by different men and in our clinic the Rubin test showed, after 60 c.c. of gas introduced into the uterine cavity, that her tubes are absolutely closed. What is the use of treating that patient except to reopen the tubes, with very questionable result? My experience with reopening of the fallopian tube is very unfavorable. Very few pregnancies have resulted and a large proportion of them have proved extrauterine. I doubt very much whether the intraabdominal opening of the fallopian tubes is going to justify itself.

DR. ALFRED HEINEBERG read a paper entitled **An Improved Method of Supporting the Bladder and Vagina After Vaginal Hysterectomy for Prolapsed.** (For original article see page 634.)

DISCUSSION

DR. JOHN M. FISHER.—From Dr. Heineberg's description I do not consider it or the Goffe operation any better than that which I have been doing for a number of years. While patients do not always return after leaving the hospital for examination and frequently drift into other hands, yet, in those that have come back I have invariably found a deep vagina and the bladder well supported.

The operation is very simple: I do an elliptical resection of the anterior vaginal wall, push off the bladder to the peritoneal reflection, then encircle the cervix with an incision, push off the mucous membrane front and back, ligate the lower segments of the broad ligaments in sections, and allow the stumps to retract. Next I incise the peritoneum anteriorly and posteriorly, deliver the fundus of the uterus through the anterior opening, ligate the infundibulopelvic and round ligaments *en masse* on one side, grasp the ligated structures on the pelvic side of the knot with a Kelly hemostat, and sever the structures well in advance of the ligature, thus freeing the uterus on one side, leaving the hemostat on the stump for later traction. The opposite infundibulopelvic and round ligaments are now easily dealt with in the same manner, thus completely severing the uterus from its attachments. After the removal of the uterus I bring down the ligament stumps by traction with the grasping hemostats and attach to them the upper angles of the vagina on each side formed by the previously resected anterior wall. The peritoneal opening left by the removed uterus is now closed with a purse-string suture in such a manner as to

leave the stumps extraperitoneal. The hemostats are now removed, permitting the ligament stumps with the attached vaginal angles to retract to the side of the pelvic wall. The elliptical gap in the anterior vaginal wall and the vaginal vault are closed with a continuous suture. A triangular resection of the pelvic floor with suture of the levator muscles and perineum complete the operation.

I have frequently demonstrated that the existence of a true cystocele, in the vast majority of cases of uterine prolapse even in pronounced cases, does not exist and that the complicated operations devised for the support of the bladder with atrophied broad ligament structures, at best are unnecessary. In a downward displacement of the uterus the base of the bladder necessarily is dragged down with it while the longitudinal tension of the vaginal wall becomes relaxed and by losing its close connective tissue attachment to the bladder the latter prolapses and presents itself in the form of a protruding pouch that in a large proportion of cases could be transfixed at the base without touching the bladder base. Push the uterus back in these cases to its normal position and you restore the bladder base while the vaginal prolapse (so-called cystocele) persists. To correct the conditions present, first do an elliptical resection of the redundant vaginal structure and then restore the uterus to its normal position by giving it proper support from below (perineorrhaphy) and by a properly adapted intraperitoneal procedure on its ligamentous structures. In cases demanding vaginal hysterectomy I do the operation previously described.

True cystocele occurs in the aged and depends upon a relaxation but more especially upon atrophy of the pelvic structures in general.

As a result of the disappearance of the loose connective tissue elements between them, fusion of the vaginal and vesical walls takes place so that the anterior vaginal protrusion presents itself in the form of a smooth, glistening, thin-walled pouch without muscular or facial support. These are the cases in which the interposition operation gives the best results while in cases demanding vaginal hysterectomy I have found the Goffe method the more logical procedure, although, owing to the atrophic changes affecting all the pelvic structures even this frequently fails to secure the desired vesical support.

DR. PHILIP F. WILLIAMS read a paper on **Postabortal Hemolytic Streptococcemia**. (For original article see page 636.)

DISCUSSION

DR. JOHN COOKE HIRST.—I have used serum in my own work and in conjunction with other work in the University Hospital. Our work began in the old days when we depended upon the Marmoreck serum, which, as you know, was not successful as it had to be transported. We used doses which were ridiculous, annoyed the patient and did not do her any good. Our results are now better; we have had a number of these cases at Mt. Sinai, but I feel the use of serum should be confined to the cases with positive blood cultures. I do not think that in cases where the infection is not yet known it should be used, but where the blood culture proves the presence of streptococci, where the serum is given early and in sufficient doses, the results have been exceedingly encouraging and in some cases almost magic. We begin with an initial dose of 150 c.c. and I believe that Dr. Williams' doses were not large enough. I understood him to say that in several cases only 50 c.c. were given at a dose. The serum should always be given intravenously. It should be preceded by desensitization of the patient. We give 150 c.c. daily for the first three days and then a few doses of 150 c.c. are given often enough to terminate

the course of the disease if there has been improvement by the first treatment. The largest amount given that I can recall was 900 c.c.; the average dose, I think, runs between 450 and 600 c.c., but the use of serum in the cases where the blood cultures are negative is also useful. Recently in the University Hospital we have been experimenting with the intravenous use of mereurochrome. There have not been enough cases to formulate any particular idea about it, but it seems to be of distinct benefit. Its use is always accompanied by an immediate and rather violent reaction, which is followed by rapid improvement, but is not of long duration. We believe that while it does not cure the patient, it very markedly aids her to get well and shortens the duration of the illness in that way.

I feel insofar as serum is concerned, if given in sufficient doses, early and intravenously, especially where the blood cultures give positive result, almost always improvement can be looked for and in many cases the cure is almost magical.

One word about blood transfusion: the repeated transfusion of moderate amounts and the massive transfusion. Of the two, the massive transfusion has, in my hands, proved much the more desirable. A single transfusion of 750 c.c. up to as high as 1100 c.c. has given much better results than repeated small transfusions.

DR. CHAS. MAZER.—A valuable adjunct to antistreptococcic serum in these cases is blood transfusion. It is our experience at the Mt. Sinai Hospital that the transfusion of blood does as much good as the antistreptococcic serum. We use the direct method and give as much as 1300 c.c.

We recently had at the Mt. Sinai Hospital a case of septic abortion with a positive blood culture. There was no appreciable improvement after 1050 c.c. of serum, and we resorted to the use of neosalvarsan with a very happy result. Four injections were given within a period of two weeks.

I wish to say a few words about desensitization of the patient as a preliminary to the administration of antistreptococcic serum. We have had such uniformly good results in the use of this agent, that we became rather careless in our method of administration. One of my patients had a severe postpartum hemorrhage with a marked rise in temperature on the third day after delivery. As the temperature continued for several days, I administered 100 c.c. of serum without desensitizing the patient. She died of anaphylactic shock within four hours. Since then I never administer serum without desensitizing the patient.

DR. J. O. ARNOLD.—A recent experience with two of these cases calls to mind the importance of early diagnosis and early use of serum. Large doses, 250 c.c., intravenously failed to produce any reaction whatever and death resulted. So in a questionable case, a blood culture should be made much earlier than is usually done.

DR. GEORGE C. HANNA.—I have three acute cases in mind who were transfused. All died. I have seen good results in the subacute type. My experience in treating septic cases with the various serums has been disappointing. I have obtained just as good results with horse serum for it is really the antibodies that do any good.

DR. JOHN M. FISHER.—In cases of retained decomposing decidua with good uterine drainage, I consider it bad practice to interfere with the uterus as a routine measure. Where curettage in such cases has been done I have time and again observed the patient have a chill followed by a higher temperature than before, in addition to other evidences of a previously localized condition having become a generalized blood infection. The doctor stated that the bacteriologic examinations of the discharges in his cases revealed the presence of streptococci. This is practically true in all cases of abortion with retained necrotic material but it does not prove that a given patient had a blood infection or that she would be any the less exposed

to such contamination by localized interference, or that she would have failed to make a satisfactory recovery under the expectant plan. I am sure that most of you here regard chills and a high temperature in the puerperium with more apprehension if these symptoms occur in the presence of a clean uterus than when they are associated with an offensive, saprophytic discharge. The former invariably is an indication of a blood infection, whereas the latter usually is dependent upon the localized condition in which the symptoms subside when the uterus is emptied of its contents. The fact cannot be too strongly emphasized, however, that nature's method of emptying the uterus is accomplished by a reactionary protective zone of cellular infiltration that gradually brings about a separation of the overlying necrotic material, while a resort to instrumental means not alone removes the dead tissue but destroys the protective zone as well, thus exposing blood and lymphatic channels to direct invasion by septic microorganisms. That a certain proportion of cases are relieved of all symptoms and go on to a rapid convalescence after instrumental interference, merely indicates an arrest of toxins depending upon necrotic putrefaction while those growing profoundly worse and often dying after a curettage are an evidence of bacterial blood invasion that is altogether too frequently regarded as a mere coincidence rather than as a consequence of the localized interference.

Concerning the serum treatment of puerperal sepsis, my own experience has been far from convincing. Considering the erratic tendencies of the disease depending upon the variability of the toxic properties of streptococci in particular, it is rather difficult to formulate observations of dependable value unless cases are studied in very large groups. At times I have been favorably impressed with its effects in individual cases but have been equally as often disappointed. Most of these cases recover in spite of all forms of treatment or no medical treatment at all, some within a week, others after several weeks, and still others linger for months and may develop all manner of septic and pyemic complications. The whole subject is still veiled in obscurity. I still hold that good food, salt solution by the rectum, open air exposure, and a good whiskey (stressing the word good) especially in cases with failing circulation and low typhoid states, are among the most valuable adjuncts in the treatment of this dread disease.

Of course if I am brought in contact with a patient with material protruding from the cervix I take a placenta forceps and pull it out, but this is altogether a different procedure from indiscriminately curetting every case.

DR. G. VICTOR JANVIER.—I trust I may be pardoned for injecting a few remarks which may not be directly germane to the discussion. After ten years in this work, I have not been able to understand why the general practitioner and why the student get the idea that dilatation and exploration, or dilatation and curettage, is an easy, harmless thing, that can be done in any hovel with the woman cocked up on the edge of the bed and her knees anchored up against the backs of two chairs. Today I approach exploration with more trepidation and fear than I do a typical pus tube, because nine times out of ten, the uterus is soft and flabby and thus easily perforated by careless instrumentation. I think too, we have awakened to the fact that we must now teach the general practitioner and primarily our students, that a dilatation and curettage should not be done in a private house. I have seen men invade the uterus with as little aseptic technic and as much abandon, as in lancing an abscess.

DR. THEODORE A. ERCK.—In former years we did not know much of streptococci or of blood examinations. At that time something was available that is unavailable today, namely good whiskey. Wouldn't it be a fair test for the man who employed antistreptococcal serum to treat an equal series with good whiskey,

giving at least an ounce every hour and if necessary for several days? I have seen several such severe cases and I am sure that is the only thing that saved them.

DR. STEPHEN E. TRACY.—I would like to ask Dr. Williams whether he can tell us what to do with the cases of staphylococcus infections.

DR. WILLIAMS (closing).—I reported these cases because they were the first cases of hemolytic blood stream infections in the service at the Presbyterian Hospital in several years' time. We do not get them very often. Sometimes we get streptococcus, but very seldom the hemolytic streptococcus. In the ordinary case of abortion I do not see that there is any harm in cleaning out the contents of the uterus. In these cases the first one had nothing done to her at all so far as operation is concerned. The other three cases were more or less considered as being in the nature of incomplete abortions and the uterus was explored more for getting rid of hemorrhage than for foul odor or to bring down temperature. We consider hemorrhage as a complication and when severe enough we decide to remove the irritation which is possibly causing the hemorrhage. We have a blood culture made on all cases that came in that look anything like blood stream infection. These were illegitimate abortions, but the third case evidently had the blood stream infected before admission. The reason for this is that so many of these women harbor the hemolytic streptococcus normally in their cervical canals. The hemoglobin percentages were not low enough to warrant transfusion though the latter may be therapeutically useful in streptococcal cases.

Department of Reviews and Abstracts

CONDUCTED BY HUGO EHRENFEST, M.D., ASSOCIATE EDITOR

Selected Abstracts

Fetus and Newborn

Bartram: *The Interpretation of Fetal Heart Sounds.* Zeitschrift für Geburtshilfe und Gynäkologie, 1921, lxxxiv, 34.

The author accepts the prevailing opinion that slowing of the fetal heart rate during labor is due to decreased placental respiratory interchange during the pains—particularly the expulsive pains. This leads to an increased carbon dioxide content of the fetal blood with vagus and vasomotor stimulation, causing a decrease in the heart rate and increase in blood pressure. The significance of uncomplicated acceleration is still under dispute, notably Seitz claims that it should not be considered a sign of asphyxia, yet acceleration following a period of slowing is rightly considered a most serious symptom and is probably due to vagus paralysis. In certain cases the slowing may be due to direct brain compression, whether by the pelvis, rigid maternal soft parts or instruments. In some of these cases the compression may be only transient with a later return to a normal status. In others a state similar to concussion of the brain in adults may give rise to transient cerebral symptoms for some days after birth, though respiration is normally established at birth. In certain of these cases of transient asphyxia, premature respiratory efforts in utero may result in the aspiration of so much mucus that resuscitation of the child is impossible, though its intrauterine heart activity may seemingly have been reestablished at a normal level.

MARGARET SCHULZE.

Bylicki, L: *Contributions to Fetal Biology.* Gynécologie et Obstétrique, 1921, iv, 541.

The author gives a short consideration of the mechanism of deglutition in the fetus. He thinks the naso-pharyngeal cavity becomes filled with amniotic fluid and that the fluid is swallowed and replaced by other fluid. He also speaks of the aspiration by the fetus of amniotic fluid. He considers it especially from the standpoint of asphyxia in the newborn. Since we do not find amniotic fluid in the respiratory passages of the newborn, he considers unnecessary some of the customary maneuvers for the resuscitation of the newborn. F. L. ADAIR.

Ganssle: *Sex Determination and War.* Zeitschrift für Geburtshilfe und Gynäkologie, 1922, lxxxiv, 159.

The author reviews the theories of the transmission of sex and the numerous explanations offered for the ordinarily slight preponderance of male children over female children at birth. He refers to the well-established idea that many more male children are born during and immediately following a war, and analyzes the various factors which have been supposed to exert some influence, such as age and parity of the mother, nutritional conditions, etc. He finds, how-

ever, that a careful analysis of statistics of large series does not show an actual preponderance of male children, but that this appears in some series merely as the percentage variation found when an insufficient number of cases are considered.

MARGARET SCHULZE.

Vignes, Henry: Signs of Death in Utero. *Le Progrès Médical*, January 8, 1921, p, 17.

Vignes finds that in the early months of pregnancy the cessation followed by a sudden return of nausea and vomiting is very suggestive of fetal death. Likewise are the appearance of a true lacteal secretion, the failure of a progressive enlargement of the uterus, or a uterus which is not in accord with its estimated size, suggestive of the same misfortune.

He finds that hydramnion, syphilis, high acute fevers or nephritis, when complicating a pregnancy, are often the etiological factors of fetal death and, when present, the case should be regarded with this possibility in mind. The more definite signs during the later months are cessation of fetal movements and cessation of the fetal heart. However, too much stress must not be placed on either of these findings unless obtained at several subsequent examinations. Another important sign is crepitation of the bones of the fetal head upon either abdominal or vaginal examination.

So long as no infection is present Vignes advocates letting the patient go into labor and expel the products of conception spontaneously. However, when other pathology is present, it may become necessary to resort to more drastic measures.

THEODORE W. ADAMS.

Liegner: Intrauterine Rigor Mortis. *Zeitschrift für Geburtshilfe und Gynäkologie*, 1921, lxxxiii, 401.

Intrauterine rigor mortis was first described by Ehrmann in 1842. It has been recorded only rarely; the author was able to find 32 cases in the literature. He believes, however, that for many reasons it is frequently overlooked, since Wolff in 6 years encountered 4 cases, and he personally observed 3 cases in one year. It develops and disappears more rapidly in the fetus than in the adult, in one case born 11 hours after intrauterine death, the height of the condition had already been passed. Fever, eclampsia, and chloroform narcosis are factors which may accelerate the development of the condition. It is of considerable clinical importance, since the loss in flexibility of the fetal body may delay the mechanism of normal labor and increase the difficulties of operative intervention.

MARGARET SCHULZE.

Blumenfeld: Congenital Abdominal Ascites with other Abnormalities. *New York Medical Journal*, 1921, cxiv, 417.

The author reports a case of dystocia in a multipara due to marked abdominal ascites of the fetus, associated with a number of other congenital anomalies.

MARGARET SCHULZE.

Tennent, Robert: Exomphalos, or Hernia into the Umbilical Cord. *British Medical Journal*, February 19, 1921, No. 3138, p. 263.

This condition may be so extreme that the greater part of the abdominal organs are contained in a sac at the umbilical attachment of the cord. It is more commonly a globular swelling about the size of a tangerine orange. Extreme cases are not susceptible of treatment. Those of more moderate degree are suitable for operation. Ballantyne has definitely defined exomphalos as true

hernia of the abdominal contents into the umbilical cord. He distinguishes it from a ventral defect in the abdominal wall to which condition he gives the name gastroschisis. Other names have been applied to this condition.

Frequency according to the various authors is one in from 2000 to 6000 births. The covering of the hernia consists of three layers, amnion, Wharton's jelly, and peritoneum. Sometimes the skin of the abdominal wall is continued some distance on the swelling. The swelling usually contains some portion of the intestinal tract and not infrequently a Meckel's diverticulum. The contents are usually irreducible. There is often intestinal obstruction and even complete strangulation. Fatality usually results from intestinal obstruction or peritonitis. Treatment: Immediate operation. The operation consists of opening the sac, separating it from the contents and returning the contents to the abdomen. The vessels of the cord are carefully ligated at the neck of the sac. If the bowel is gangrenous the outlook is hopeless. Meckel's diverticulum if present should be removed. Appendicostomy can be done in some cases. The author reports 5 cases, 4 recoveries and 1 death. Etiology: Possible factors are abnormalities in fetal position; hydramnios lordosis in fetus; unduly short cord; developmental defect of skin or mesoblastic layer of abdominal wall; functional defects due to trophic disturbances, fetal dropsy.

The most likely cause in the writer's opinion is a developmental or functional defect of the mesoblastic layer of the abdominal wall. Treatment to be successful must be immediate. Operation is preferable. F. L. ADAIR.

McAuslin, J. T.: "Harlequin Fetus" (Hyperkeratosis Congenitalis). British Medical Journal, Jan. 29, 1921, No. 3135, p. 155.

This is a short article published with a plate. Mother 16 years old. Full time fetus stillborn. Weight seven pounds. The skin was dead white, cornified and cracked in all directions. The skin changes were universal. The hardened scales were removed and a red raw looking surface was exposed. The eyes showed no differentiation into iris, etc, and appeared as two blood filled sacs. On autopsy, the internal organs were apparently normal except the thymus which contained numerous scattered abscesses. No definite evidence of syphilis in mother or fetus was made out. This condition should be distinguished from ichthyosis by the fact that it is present at birth, while the latter condition appears toward the end of the first year; also by its distribution which is general while ichthyosis is rarely widespread at first; by the fact that it always affects the palms and soles which ichthyosis hardly ever does. F. L. ADAIR.

Dacharry, Norberto A.: Resuscitation of Newly-born Child Without Heartbeats by Intracardiac Injection of Adrenalin. Semana Medica, Buenos Aires, 1922, xxix, 135.

The author has been unable to find in the literature any report of the use of adrenalin in resuscitating the newborn. The case reported by him concerned the delivery of the child of a woman in labor at term in her ninth pregnancy. Her previous labors had all been difficult ones, five children having been extracted with forceps, of whom one was stillborn, two died within 24 hours, and two lived; the remaining labors had been spontaneous, and one child thus born had died in twenty-four hours.

The present labor showed marked dystocia, and after seventeen hours of labor with membranes ruptured, the head had not engaged. Forceps were applied but the head could not be brought into the pelvis, and a version was de-

cided upon. As the breech was brought down, the cord came down with it. The head was brought into the pelvis only by the use of very strong suprapubic pressure, and was delivered from the pelvis by forceps.

The child was born in asphyxia pallida, and no heartbeats could be elicited. The cord was cut, and a syringe of 1 or 2 c.c. capacity containing 1/3 of one c.c. of 1:1000 adrenalin, with a needle 3 cm. long and 0.5 mm. caliber was prepared for the injection. This was made in the fourth left intercostal space about 12 mm. inside the nipple of that side, and the needle inserted half a centimeter. About a minute and a half later the heart was felt to beat energetically, and ten minutes later, after warm bath, artificial respiration, etc., the baby breathed spontaneously.

Baby lived nine days. Autopsy showed subdural hemorrhage, heart and pericardium normal, with no trace of needle puncture.

THOS. R. GOETHALS.

Kirstein: A Remarkable Biological Peculiarity of the Newborn. *Deutsche medizinische Wochenschrift*, 1921, xlvii, 1393.

Not only Kirstein but other investigators as well, found what they considered Loeffler bacilli in from 23 to 85 per cent of all newborn babies examined. Only a few showed clinical signs of diphtheria. These cases usually run a very mild course and are, therefore, easily overlooked. On account of the difficulty, if not futility, of immunizing the newborn, an attempt was made to immunize them by the injection of toxinantitoxin into the mother. Of the children from 263 mothers thus immunized, 4.6 per cent had diphtheria infections, while only 4.4 per cent of the children from 661 mothers not immunized showed such infection. This seems to prove that acquired immunity against diphtheria is not transmitted from mother to child. Kirstein has the impression that the administration of antitoxin has no specific curative action in the newborn, though he advises the continuation of its use until the matter is further cleared up.

R. E. WOBUS.

Schubert: The Etiology of Birth Palsy. *Zentralblatt für Chirurgie*, 1922, xlix, 363.

Schubert takes up briefly some of the theories advanced about the etiology especially for brachial paralysis. Since this form of birth palsy is often associated with paralyzes of muscle groups not innervated by the brachial plexus, he feels that the trouble must be central. He thinks that most of these paralyzes can be ascribed to developmental defects but gives no conclusive reasons for his theory. Instead of ascribing them to birth trauma, he classes them with such developmental defects as congenital hip joint dislocations and foot deformities.

R. E. WOBUS.

Platt, Harry: Birth Paralysis. *British Medical Journal*, Nov. 26, 1921, No. 3178, p. 885.

The author considers only that type of lower neuron paralysis of the upper limb seen in the newborn and due to definite injury during delivery. From the available statistics, he considers that about 4 result from vertex presentation to 1 from breech presentation. It is occasionally associated with traumatic lesions and external mastoid hematoma or fracture of the humerus or clavicle. The author takes up early and later symptomatology. He considers the treatment under three heads: (1) Early postural treatment. The injured limb should at once be fixed in the position of abduction and external rotation at the shoulder, the elbow flexed, the forearm supinated and the wrist dorsiflexed.

Further treatment consists of continued splinting with daily passive stretching of the shoulder joint. (2) Operative exploration of the brachial plexus. This should not be done under nine months in any case. It is rarely needed and may not even be feasible. (3) The treatment of the contractures. This consists of the reduction of posterior subluxation with the internal rotation contracture by means of a single manipulation under anesthesia. This procedure is often difficult in children over one year and usually fails in those over two years.

F. L. ADAIR.

Leroux, Robert: Otitis in the Nursling and the Newborn. *La Presse Médicale*, December 17, 1921, No. 101, p. 999.

Otitis occurs quite frequently in the nursing infant and not infrequently results in pyemia and meningitis. Leroux thinks the otitis is somewhat different in the nursling from that in the adult. There are certain anatomic considerations which favor the development in the newborn and in the nursling. Paracentesis tympani without delay is an important therapeutic measure. He thinks it may be caused by the aspiration of material at the time of birth. The ears as well as the eyes in the newborn should be protected at the time of birth. The nasal fossae should be vigorously disinfected at the time of confinement and on the following days.

F. L. ADAIR.

Liebe: Gonococcal Skin Lesions in the Newborn. *Deutsche medizinische Wochenschrift*, 1921, xlvii, 1590.

While the gonococcus ordinarily affects only mucous membranes, it may, under certain conditions, attack the delicate skin of the newborn as the following case shows. A child was born without difficulty in left occipito-posterior position. Four days after birth, vesicles developed on the left thumb which contained a cloudy, serous exudate. These gradually spread to two fingers. At the same time small vesicles appeared on the right cheek, gradually involving part of the face and scalp. All vesicles contained gonococci in pure culture. The lesions were checked after 14 days, being treated at first with 1 per cent and later with concentrated solution of silver nitrate. Epidermization was complete after another 14 days. An extension to the eyes by daily installation of silver solution.

R. E. WOBUS.

Turnbull: Congenital Syphilitic Inflammation of the Long Bones. *Lancet*, 1922, ccii, 1239.

Syphilis in the fetus or in infants may give rise to inflammation in the diaphysis, at a distance from the epiphysis, or in the periosteum. More commonly it causes inflammation in the diaphysis at its junction with the epiphyseal cartilage.

The curtailment of the normal vascular supply causes portion of the epiphyseal cartilage to degenerate. The line of junction of the epiphysis with the diaphysis appears dentate. As growth proceeds, the level at which provisional calcification should normally take place may reach the transverse chondral vessels. This leads to the occurrence, in the epiphyseal cartilage, of red streaks and dots which are each bordered by a narrow zone of yellow calcification. As this progresses a more remarkable appearance is produced—a yellow, usually irregular, line of provisional calcification is followed by a zone of red marrow, in which osseous trabeculae can be felt with the point of the scalpel, and this red marrow is separated from the red diaphysis by a second, the original-yel-

low abnormally deep, zone of provisional calcification. Fibrosis is seen with the microscope in all but the earliest and slightest lesions.

Syphilitic diaphysitis occurs with considerable frequency in the medulla of the diaphysis. The fibrosis is associated first with cessation of the deposit of bone and later with erosion of the trabeculae of bone and calcified cartilage.

Syphilitic periostitis is rare, but may accompany advanced osteochondritis. It results in a layer of bone and red marrow or rarely granulation tissue being deposited outside the original corticalis.

Congenital syphilitic disease of the bone is not a general systemic condition, but is due to the local presence of the spirochetes. The older the child the fewer the portions of bone affected. The femur, tibia, humerus, and ribs are sites of election.

NORMAN F. MILLER.

Lindig: Glycosuria in the Newborn. *Klinische Wochenschrift*, 1922, i, 995.

The author repeated the work of Hoeniger upon the excretion of sugar in the urine of newborn children delivered by forceps. The latter found a "temporary traumatic" glycosuria in each of four children thus delivered, the sugar excretion lasting only two to four days. He considers this to be due to the sudden application of force to the head, analogous to puncture glycosuria. Sugar is not found in the urine of spontaneously delivered children, even though the labor be tedious and the compression of the head prolonged. Lindig, however, does not think that the question can be settled so simply, as the causes of glycosuria are legion and the mechanism often complicated. He notes that Kausch has reported that other traumatisms, even when not acting on the skull, can produce glycosuria; so can anesthesia, anoxemia, etc. He found sugar persisting in the urine for seven days of only three out of twenty-four male children delivered by forceps, and hence concludes that the question is still an open one. A further report based on a more exhaustive study, is promised.

E. L. KING.

Hartmann, Henri: Pyloric Stenosis in the Nursling. *Gynécologie et Obstétrique*. 1922.

The author emphasizes the importance of distinguishing between a true hypertrophic muscular stenosis and a pyloric spasm. Operative procedure in the two cases is entirely different. The submucous pylorotomy is easy and meets all indications for the pyloric spasm. In cases of hypertrophic stenosis the operation is more serious. It should be done as early as possible and consists preferably in a gastroenterostomy.

F. L. ADAIR.

Browne, F. J.: Pneumonia Neonatorum. *British Medical Journal*, March 25, 1922, No. 3195, p. 469.

The author quotes 80 cases of infantile deaths in which 21 or 26.25 per cent were due to pneumonia. Over half of these were in premature infants. Ages varied from 8 hours to 5 weeks. Five of the infants were syphilitic. Some of the infants, especially the premature ones, had atelectatic areas in the lungs. It is probable that premature rupture of the membranes predisposes to pneumonia. A child may be born not only infected but even suffering from pneumonia in an advanced stage. The infant has little defensive reaction. At post-mortem examinations the disease may be missed if microscopic examination of the lungs is not made.

F. L. ADAIR.

Miller: Omphalorrhagia with a Record of Two Cases. Transactions of the Edinburgh Obstetrical Society, Session lxxxi, 1921-1922, p. 97.

Congenital obliteration of the bile duct is accompanied by hemorrhages in 80% of cases. Icterus was associated with 77 out of 178 cases of omphalorrhagia collected by Jenkins. Systemic infections (frequently developing in utero) have been associated with omphalorrhagia on various occasions. No characteristic organism has been isolated. Syphilis may be a factor through its effect on the blood vessels and liver, or indirectly through lowered resistance to bacterial invasion. Hemophilia is seldom a factor in cord hemorrhage. Hemorrhage from the cord was noted only 9 times in 576 hemophiliacs.

The prognosis in true omphalorrhagia is grave, 84% of the recorded cases dying. The treatment is both general and local. Syphilis should be treated vigorously during pregnancy. Umbilical infections are treated along surgical lines. Hemorrhage is controlled by purse string suture or acupressure with crossed needles. More important, both in replacing lost blood and supplying elements facilitating coagulation, is the use of blood transfusion. Transfusion should be done early and often. Locally, styptics and coagulants are of little or no value and frequently waste valuable time.

H. W. SHUTTER.

Alam: A Case of Abnormal Labor (Hydrothorax and Ascites in the Fetus). Indian Medical Gazette, 1922, lvii, 260.

The author reports the case of a multipara, 32 years of age, in her sixth pregnancy. She had five normal labors, with five children living and well. She gives a history of becoming easily fatigued on exertion with a tightness and fullness in the abdomen and chest. No fever or vomiting at any time. Very irritable and quarrelsome, even behaving like a mad person at times. The present labor started in the ninth lunar month. The pains were very short and at long intervals, felt only at the pubes. When seen, the woman was in great distress having been in labor for two days. On examination the abdomen was very large with two small feet protruding from the vagina. The legs were found broken and on pulling they were broken off and removed. The patient was put under chloroform and the uterus explored. A small head was found with a large sac-like body. Version was performed with difficulty and the head delivered by forceps. Pulling on the head caused it to separate easily, leaving the body in the uterus. The hands were delivered and broken off. Clavicles were also broken in attempting to extract the body. The thorax was then perforated with the fingers and four pints of clear colored fluid came out. The diaphragm was next perforated, and more than five pints of clear ascitic fluid escaped. The sac-like body could finally be delivered. Placenta had to be stripped off and an intrauterine douche given. Examination of the mutilated body showed marked malformations of all structures. The patient developed bronchitis but recovered rapidly and was up on the ninth day without any further trouble.

F. J. SOUBA.

Item

The forty-eighth annual meeting of the American Gynecological Society will be held in Hot Springs, Va., May 21, 22 and 23, 1923.

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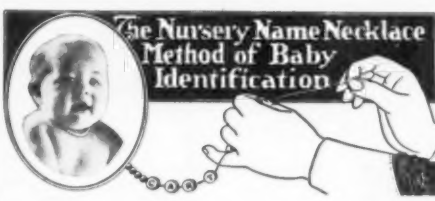
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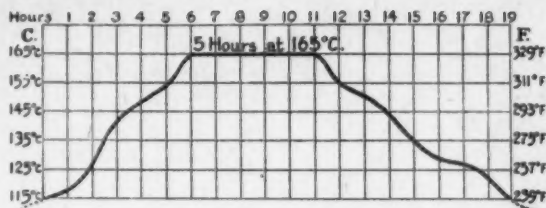
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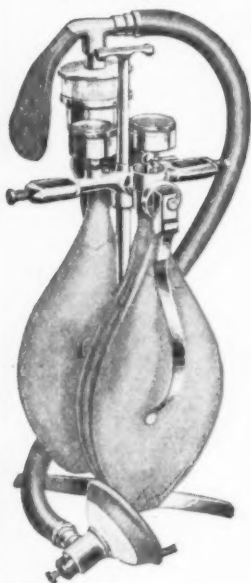
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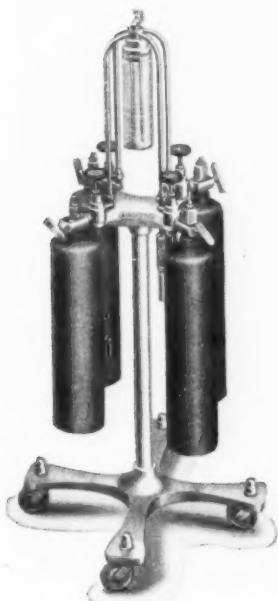
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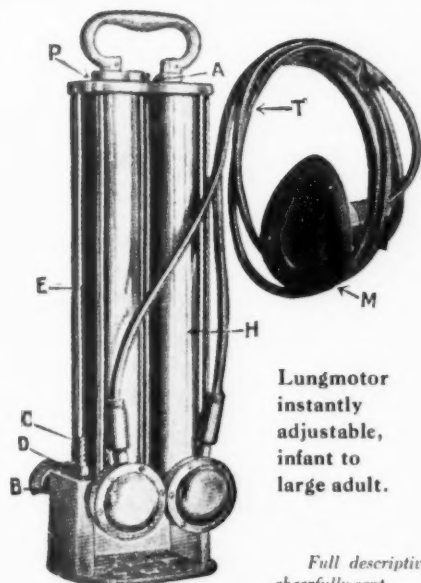
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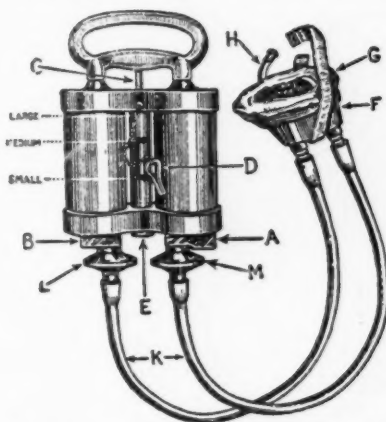
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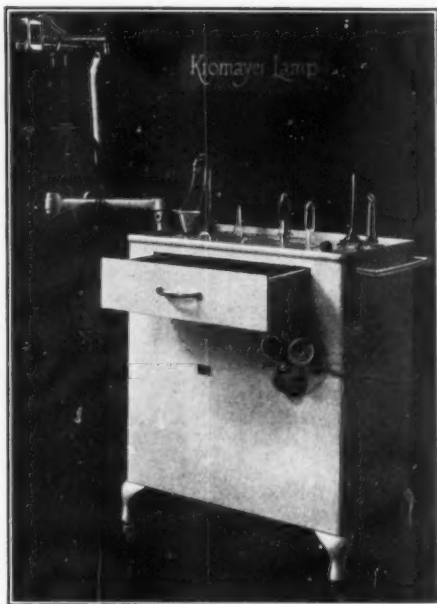
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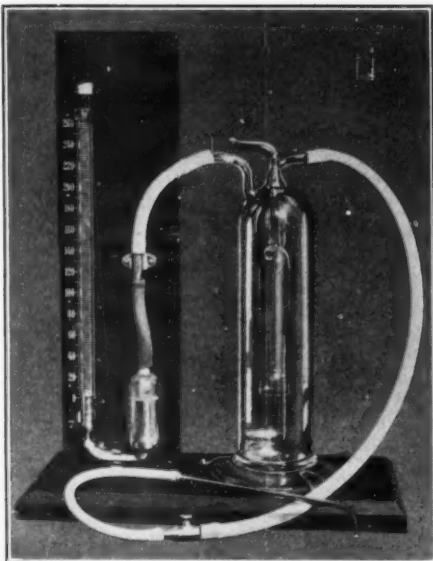
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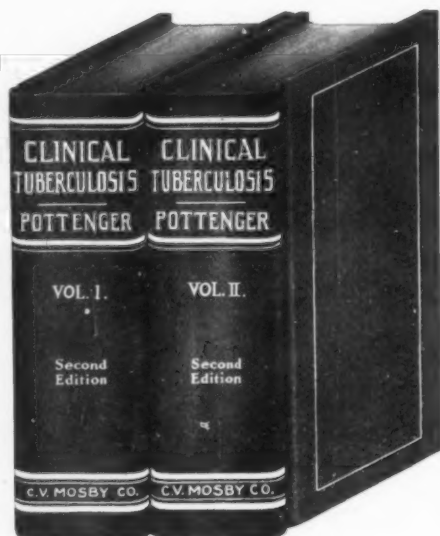
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